2. THE PROPOSED ACTION AND ALTERNATIVES

This section describes the Proposed Action, alternatives to the Proposed Action including the No Action Alternative, and alternatives eliminated from further consideration. In addition, proposed technologies that are integral to the project are described to provide the reader with sufficient information to understand the scope and purpose of the major project elements.

2.1 Proposed Action

2.1.1 DOE's Proposed Action

Under the Proposed Action, DOE would provide cost-shared funding to a private-sector applicant for the design, construction, and demonstration of a Co-Production Facility based on an innovative atmospheric-pressure circulating fluidized-bed (ACFB) boiler with a compact inverted-cyclone design. In addition to producing electricity and steam, the Co-Production Facility would include a kiln that would produce cement for use in the production of structural brick and other similar products. The Co-Production Facility would utilize coal refuse (also referred to as "gob") from nearby coal refuse sites as ***a*** fuel source, and portions of the ash generated by the circulating fluidized-bed (CFB) would be returned to the coal refuse sites for use in site reclamation efforts. DOE has entered into a 5-year cooperative agreement with Western Greenbrier Co-Generation, LLC (WGC) to provide financial support through the CCPI Program. The cooperative agreement consists of four phases including:

- Phase I - Project Definition
- Phase II - Detailed Design and Construction
- Phase III - Start-Up and Test
- Phase IV – Demonstration (12 months)

DOE has authorized Phase I of the cooperative agreement to provide financial assistance for technical and economic evaluations to identify the optimum plant configuration and to establish a reliable capital cost estimate in the form of fixed price bids for detailed design and construction. This phase also includes the development of the financial structure and legal documentation necessary to obtain bond financing for subsequent phases of the project. DOE will use data prepared in Phase I to facilitate its decision-making process related to the execution of the remaining three phases of the cooperative agreement. Phases II, III, and IV are contingent upon a Record of Decision (ROD) by DOE to go forward with funding of these phases. DOE's total participation under the cooperative agreement could be approximately ***$107.5*** million for the project. The new Co-Production Facility would be designed by WGC for long-term commercial operation (at least 20 years) after completion of the cooperative agreement with DOE.

2.1.2 Western Greenbrier Co-Generation (WGC), LLC Project Overview

WGC was a successful applicant in Round 1 of the CCPI Program and will be ultimately responsible for the siting, design, construction, and operation of the facility and related components. WGC is collectively owned by the towns of Rainelle, Rupert, and Quinwood, and its mission is to provide economic development for the area through the construction and operation of the proposed facility. WGC has the following specific objectives for the project:

- Utilize coal refuse as fuel to generate approximately 98 MWe (net) for sale while remediating a significant environmental hazard through the ***remediation*** of multiple coal refuse piles in the vicinity of Rainelle.
- Process a significant fraction of the combustion ash in a kiln to convert it physically and chemically to a cement material, while routing the exhaust gas from the kiln back to the power plant to reduce kiln emissions. The cement could be sold to third parties for use in the manufacture of building products (e.g., structural blocks).

- Return the balance of waste ash to the coal refuse sites to assist in remediation efforts by providing a source of alkalinity to neutralize acid runoff.
- Provide process steam and recover waste heat from the steam cycle, which is normally rejected to a heat sink such as a cooling tower, for productive use in heating local buildings, greenhouses, and aquaculture facilities.
- Generate sufficient revenues from the sale of electricity, cement, and recovered heat to repay the private and government funds used to finance the project. The sponsoring municipalities aim to foster economic development in the region.
- Demonstrate that the integrated project concept is technically and economically viable for larger, commercial scale units (e.g. >200 MWe).

The main focus of the WGC Co-Production Facility Project is the construction and operation of the 98 MWe generating plant that utilizes the technologies described in Section 2.3. However, there are several unique and important aspects of the project that extend beyond the construction and operation of the power plant. In addition to generating power for the national grid and demonstrating the inverted cyclone technology, the proposed plant is intended to use coal refuse as ***a*** fuel source, to apply potential waste streams to beneficial uses, and to serve as an economic catalyst for the region by providing an anchor tenant for a planned industrial park (the "EcoPark") to be located in Rainelle. As a result, there are connected actions associated with the excavation and reclamation of the proposed coal refuse piles (e.g., beneficiation of the coal refuse by a third party), the additional industrial activities that may occur with the project (e.g., potential production of building products from the cement), and potential future commercial and industrial development that are intended to occur as a result of the plant. These additional project aspects are not integral to the DOE decision on whether to provide cost-shared funding to demonstrate the clean coal technologies of interest.

2.2 Locations of Principal Project Features

This section describes the principal project features and provides an overview of the major components of the WGC Project. Because planning considerations are beyond the realm of consideration by the federal decision-makers, they are presented in Section 2.4 for comparative purposes and to provide additional background information. The proposed project and related elements cover a number of areas in the vicinity of Rainelle, West Virginia (see Figure 2.2-1). Rainelle is located in western Greenbrier County, approximately 30 miles (50 kilometers) northwest of Lewisburg (the county seat) on US 60 (also referred to as the Midland Trail). The major components of the project, as described in the following sections, include:

- Power Plant Site, Cement Kiln and potential ash byproduct facilities, and EcoPark
- Fuel Sources
- Beneficiation/Prep Plant Site
- Limestone Sources
- Water Supply Sources
- Material Transportation
- Power Transmission Corridors

2.2.1 Co-Production Facility

The proposed site for the Co-Production Facility is located principally in an area identified as the "E&R Property," which is positioned just within the southwestern city limits of Rainelle (see Figures 2.2-2 and 2.2-3). The site includes approximately 23 acres (9 hectares) of land directly southeast of the proposed EcoPark site across Sewell Creek. From its boundary with Sewell Creek, the site extends to the

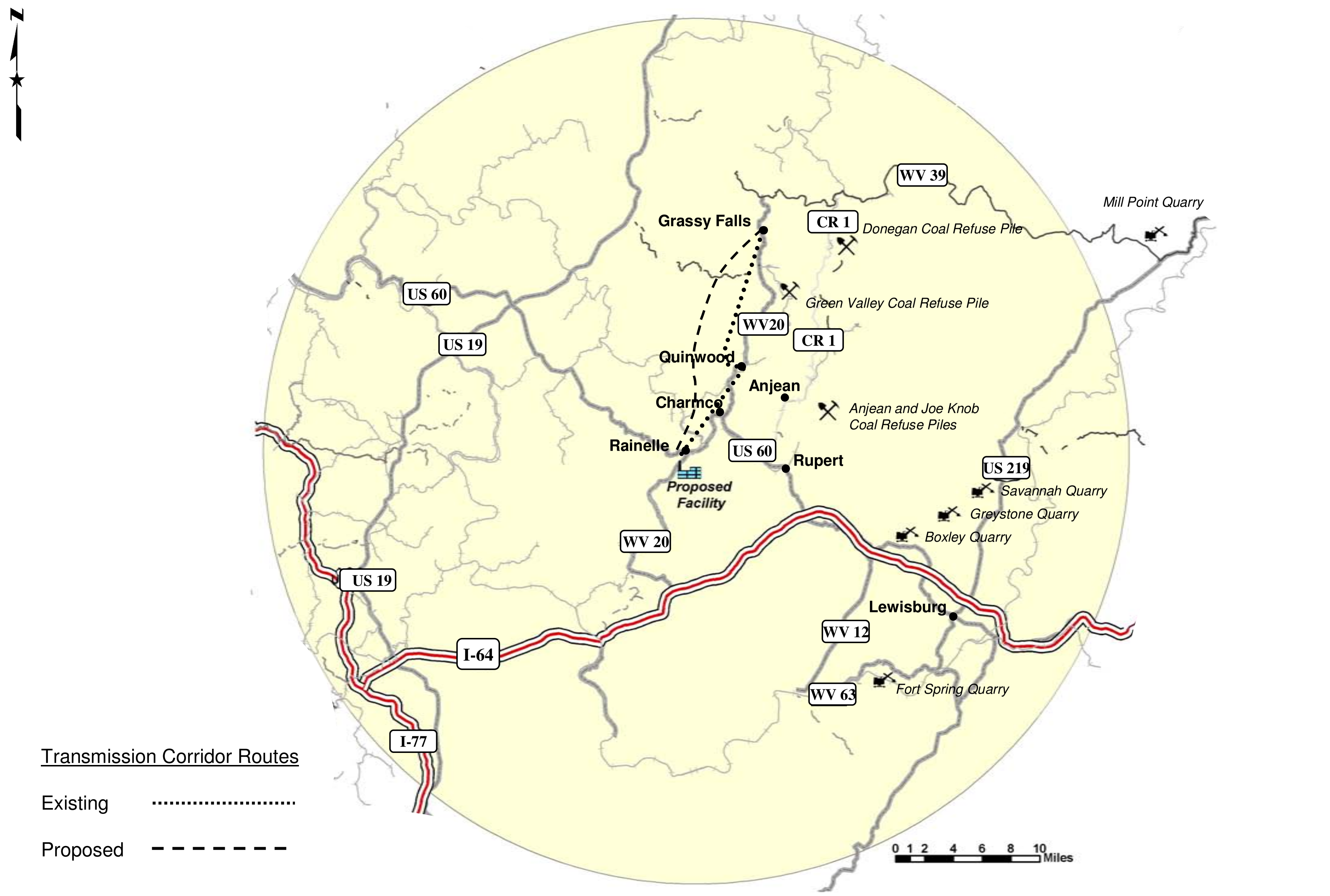

Figure 2.2-1
General Location Map (30-Mile radius)

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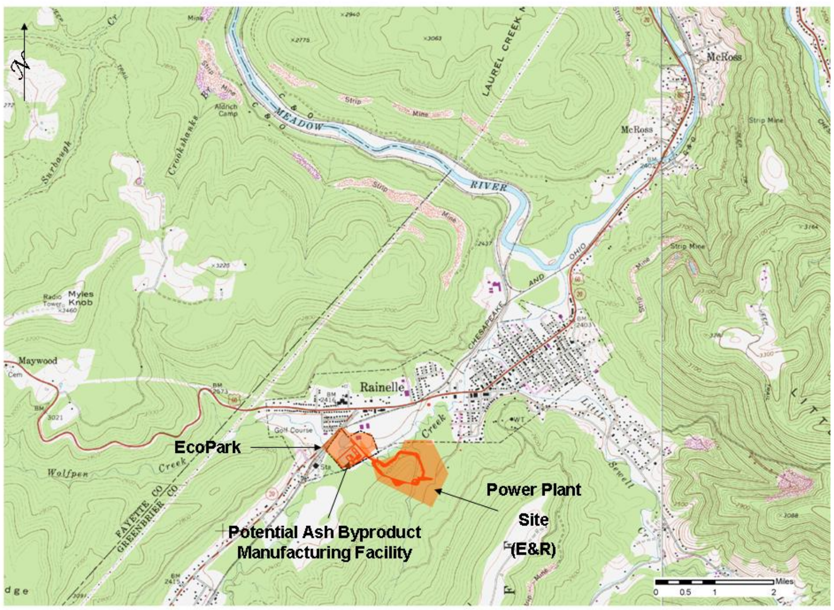
east and southeast astride the partially leveled northeastern end of a ridgeline connected with Sims Mountain. The proposed EcoPark site is located within the city limits of Rainelle and consists of approximately 26 acres (11 hectares) of land between Sewell Creek, Wolfpen Creek, and a CSXT rail line that parallels WV 20. The potential ash byproduct manufacturing facilities (privately financed and independent of the Co-Production Facility) is currently planned to be located in the southern portion of the EcoPark property on a 6-acre (2-hecatre) site immediately northwest of Sewell Creek.



View from US 60 looking south

View from EcoPark site looking south

Figure 2.2-2 WGC Project Site

2.2.2 Fuel Sources

A major feature of the WGC Project is the use of coal refuse from nearby coal refuse piles, also referred to as "gob" piles, as a fuel source for the boiler. This feature is important, because it is expected to provide added benefits to the state by addressing a persistent regional problem – water quality deterioration due to runoff and leachate from coal refuse piles – in addition to generating economic benefits associated with the construction and operation of the Co-Production Facility.

WGC is considering coal refuse sites that are within approximately 30 miles (50 kilometers) of Rainelle (see Figure 2.2-4), that are reasonably accessible from existing roads, and that have acceptable coal refuse characteristics (e.g., British thermal unit (BTU) value, sulfur content, particle size, etc.). WGC's conceptual design has identified four coal refuse sites (Anjean, Joe Knob, Donegan, and Green Valley) that would serve as the initial fuel sources for the Co-Production Facility (see Figures 2.2-5 through 2.2-8). WGC proposes to extract coal refuse from these four sources over a 20-year operating period at a rate of approximately 1.2 million tons (1.1 million metric tons) per year. It is ***estimated*** that the sequence of use and the period required to completely use each coal refuse source would be as follows:

- Anjean (3.5 million tons [3.2 million metric tons]) – 3 years;
- Joe Knob (approximately 1.5 million tons [1.4 million metric tons]) – 1 year;
- Donegan (approximately 12 million tons [11 million metric tons]) – 11 years; and
- Green Valley (6 million tons [5 million metric tons]) – 5 years.

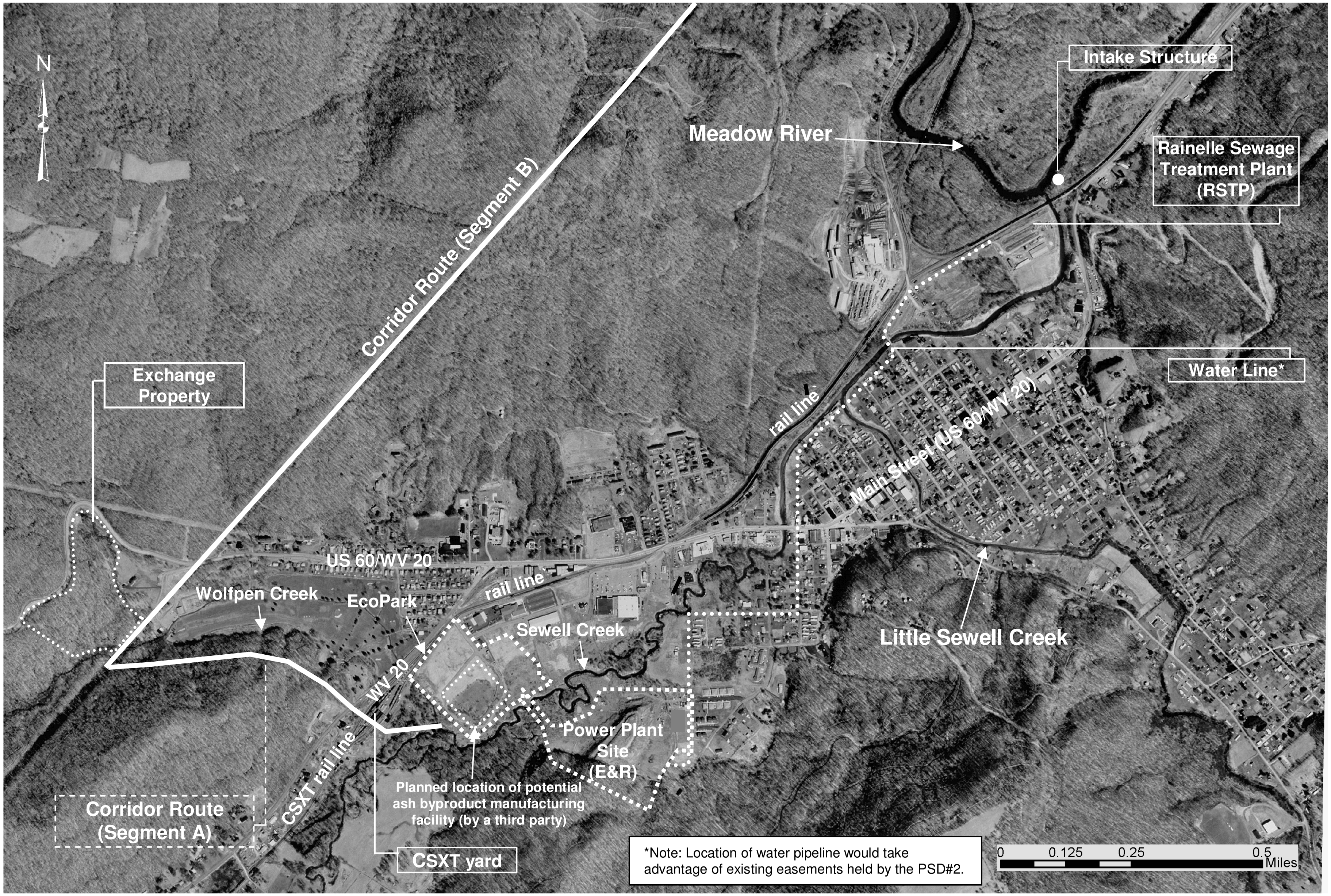


Figure 2.2-3.
Aerial Photo Depicting Site Boundaries
Map Source: USGS orthophoto map (1:12,000) Rainelle NE, 1996

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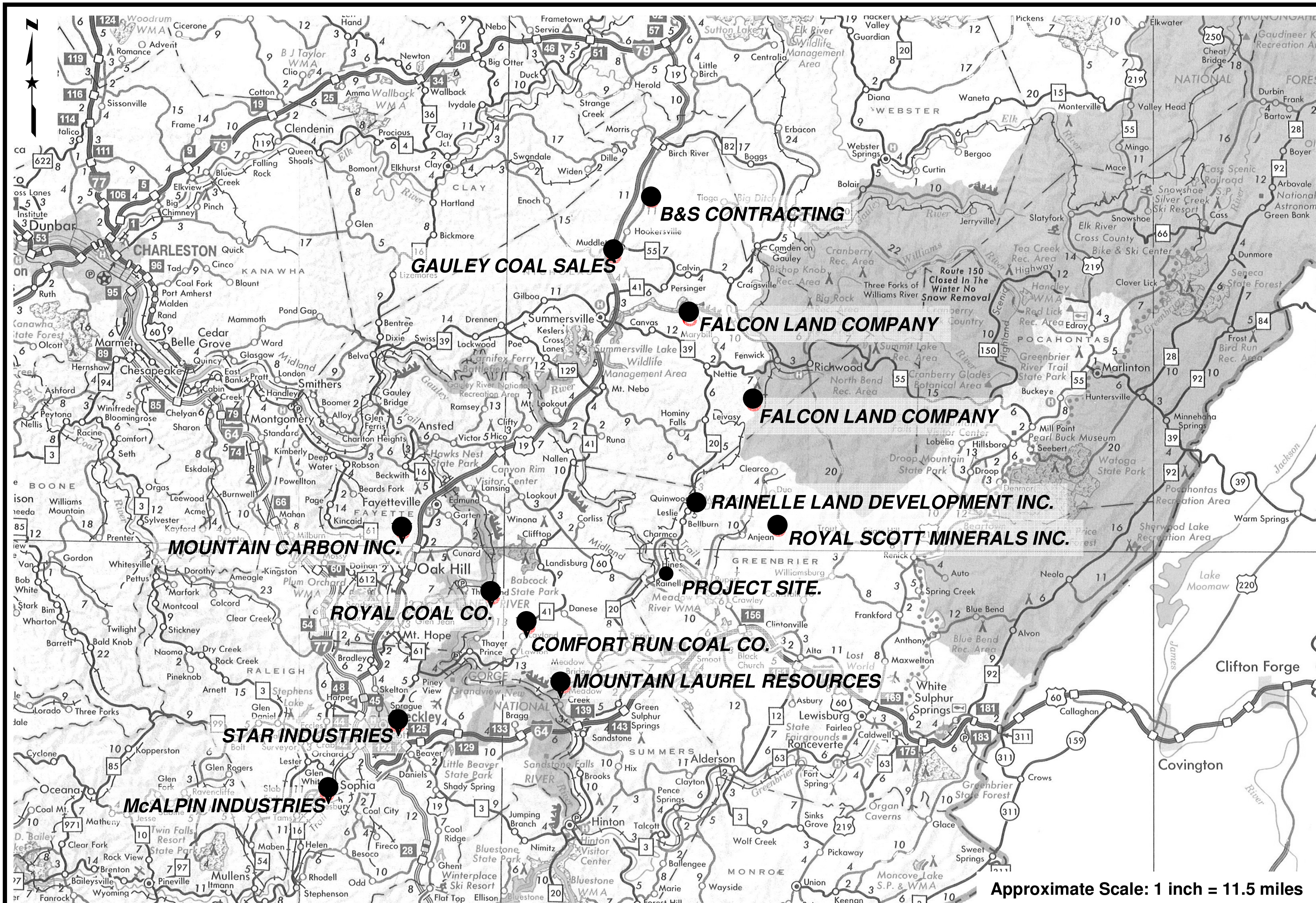

Figure 2.2-4.
Forfeited Permits With Coal Refuse Within Approximately 30 miles of Rainelle
Map Source: WVDOT Highway Map; Data Source: WVDEP, 2005

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Donegan and Joe Knob are currently undergoing core drilling and volumetric measurements to determine more accurately the potential amount of available fuel supply. These initial sites were selected by WGC in collaboration with WVDEP. When these sources become depleted, additional sites will be identified and considered in accordance with WVDEP clean-up priorities.

Anjean Site – The initial fuel supply for the Co-Production Facility would come from Anjean Mountain, also referred to as Buck Lilly (see Figures 2.2-5 and 2.2-16), an abandoned surface mine, which is located approximately 14 miles (23 kilometers) northeast of the Co-Production Facility site. This site is owned by the Western Greenbrier Business Development Corporation (WGBDC). The entrance to Anjean Mountain is approximately 6 miles (10 kilometers) north of Rupert on Anjean Road (CR 1).

Figure 2.2-5. View of Anjean Mountain

Figure 2.2-6. View of Green Valley

Green Valley Site – The Green Valley coal refuse site (see Figures 2.2-6 and 2.2-17) is located approximately 12 miles (19 kilometers) north of Rainelle and 3 miles (5 kilometers) north of Quinwood on WV 20, just east of the community of Green Valley in southern Nicholas County. The site is owned by the Green Valley Coal Company (GVCC). The northwest portion of the site is bordered by WV 20, and Hominy Creek and a small tributary borders it along the south and east.

Initially WGC's intent was to focus on using these two coal refuse pile sites assuming that they could provide at least 11 years of fuel to the facility (WGC, 2005). However, project financing agreements under negotiation by WGC would require a minimum of 20 years demonstrated fuel supply. Therefore, WGC has evaluated additional coal refuse pile sites and is currently investigating sites located at the former Donegan and Joe Knob mines (see Figures 2.2-7 and 2.2-8).

Figure 2.2-7. View of Donegan

Donegan Site –The Donegan Site (see Figures 2.2-7 and 2.2-18), which is owned by the Falcon Land Company, LLC, is located along CR 39/14 and is adjacent to the community of Jetsville in southeastern Nicholas County. The site is approximately 14 miles (23 kilometers) north of the Anjean coal refuse site and is located a total of 28 miles (45 kilometers) from Rainelle (see Figure 2.2-1 for site vicinity map).

Figure 2.2-8. View of Joe Knob

Joe Knob – The Joe Knob site is located on lands managed by Mead–Westvaco (see Figures 2.2-8 and 2.2-16) approximately 2 miles (3 kilometers) east of the Anjean site following the same access road off CR 1 that reaches Anjean's Buck Lilly pile.

2.2.3 Beneficiation/Prep Plant Site

WGC intends to procure the services for crushing, sizing, and beneficiation of coal refuse from a third party, which would design and construct a "Low Elevation Coal Processing Plant" (hereafter referred to as a prep plant). The prep plant system is a fairly new innovation, which can be used in conjunction with modern surface mining methods to provide beneficiated coal at or near a mine site. The major advantage to the proposed prep plant is the reduction in its height and structures and its modular design, which is optimized for the relative ease of construction and disassembly for relocation and use at another coal refuse source. The beneficiation process is described in Section 2.3.6, and planning considerations for the prep plant are described in Section 2.4.4.

Figure 2.2-9. View of AN1

As was mentioned in Section 2.2.2, the sequence of use for the four sources of coal refuse would begin with Anjean and Joe Knob, then Donegan, and finally Green Valley. For the purposes of siting a prep plant, Anjean and Joe Knob are considered one source because of their close proximity to each other (access between both coal refuse piles is within 2 miles [3 kilometers] and on the same haul road). Therefore, a total of three sites would ultimately be used for prep plant operations at different stages of the project. To minimize transportation-related impacts, such as costs, traffic safety, and exhaust emissions, the location of the prep plant would ideally be at or near the fuel source. The suitability of a site for a prep plant would be based on several siting criteria, including property availability, acreage, accessibility, proximity to coal refuse source, utilities, environmental impacts (e.g., potential for flooding) and required permits.

Figure 2.2-10. View of AN2

WGC is in the preliminary stages of screening prep plant sites and has identified six areas as possible candidates. The candidate sites are presented in Figures 2.2-9 through 2.2-15. AN1, AN2, and AN3 are candidate locations for the prep plant to process coal refuse from the Anjean and Joe Knob sites. DN1 and DN2 are candidate sites for the Donegan prep plant, and GV is the proposed location for the prep plant at Green Valley. The majority of the sites are located within a mile or two of the fuel source that they would be processing, with the exception of DN2, at Beech Knob, which is located approximately 7 miles (11 kilometers)

Figure 2.2-11. View of AN3

south of Donegan. All of the sites, with the exception of DN2, are located away from homes, businesses and other sensitive receptors. DN2 is adjacent to the current property owner's residence.

AN1 is located near the valley bottom and near the base of the access road leading to the Anjean coal refuse pile. The land is maintained by Mead-Westvaco. Currently, the site includes settling ponds that are used by WVDEP to manage some of the runoff from Anjean's coal refuse area. AN2 is located west of CR 1 and is directly across CR 1 from the access road leading to the Anjean coal refuse pile. This property is owned by Mead-Westvaco and includes an abandoned rail line and gravel road. AN3 is located at the foot of the Buck Lilly pile along the access haul road. This area is currently owned by WGBDC and is approximately 2 miles (3 kilometers) west of Joe Knob.

Figure 2.2-12. View of DN1

Figure 2.2-13. View of DN2 (Beech Knob)

DN1 is the location of a previously developed site on CR 39/14, which provides access to the Donegan site. The site includes an abandoned building, which was used in the past for Donegan's mining activities. This site is located on the west side of CR 39/14 and is approximately 500 feet (150 meters) north of the access road to the Donegan coal refuse pile. The land is currently being held by the state for tax recovery.

DN2 is on developed, private property adjacent to CR 1 and may have been used in the past for agriculture. This location is approximately 7 miles (11 kilometers) south of Donegan. An existing haul road, which parallels CR 1, was used in Donegan's mining past and could be used again by off-road trucks to transport coal refuse to a point of intersection with CR 1 approximately 10 miles (16 kilometers) south of Donegan. DN2 could potentially serve the Anjean, Joe Knob, and Donegan sites.

Figure 2.2-14. View of GV

At this time, WGC has identified one area to potentially serve as the prep plant site for the Green Valley coal refuse pile. Access to the site is located along WV 20, in the vicinity of the coal refuse pile. The site is situated along the southern boundary of the refuse pile and is partially located on the pile.

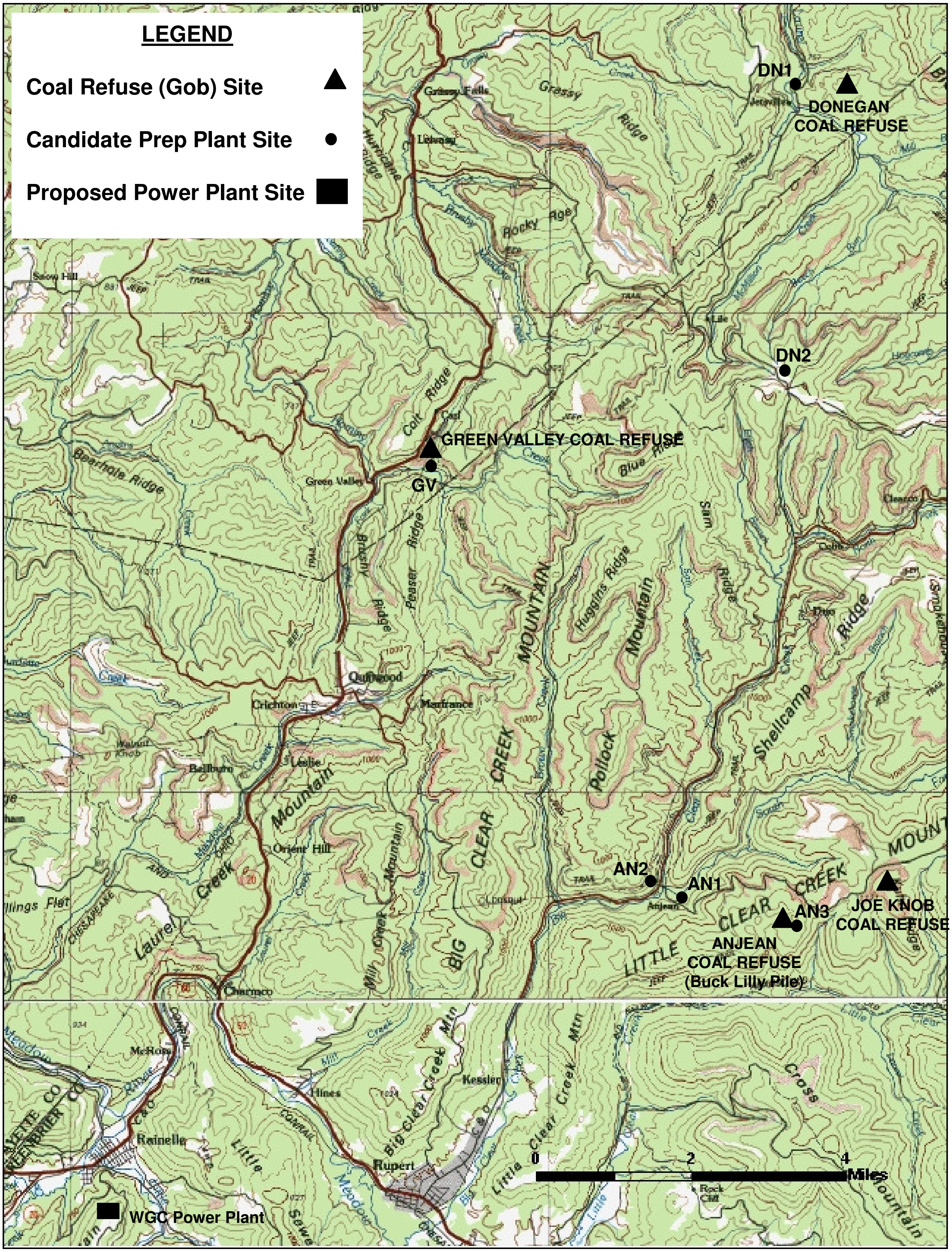

Figure 2.2-15.
Coal Refuse and Candidate Prep Plant Locations
Map Source: USGS topo maps (1:100,00) Marlinton (1979) and Lewisburg (1984)

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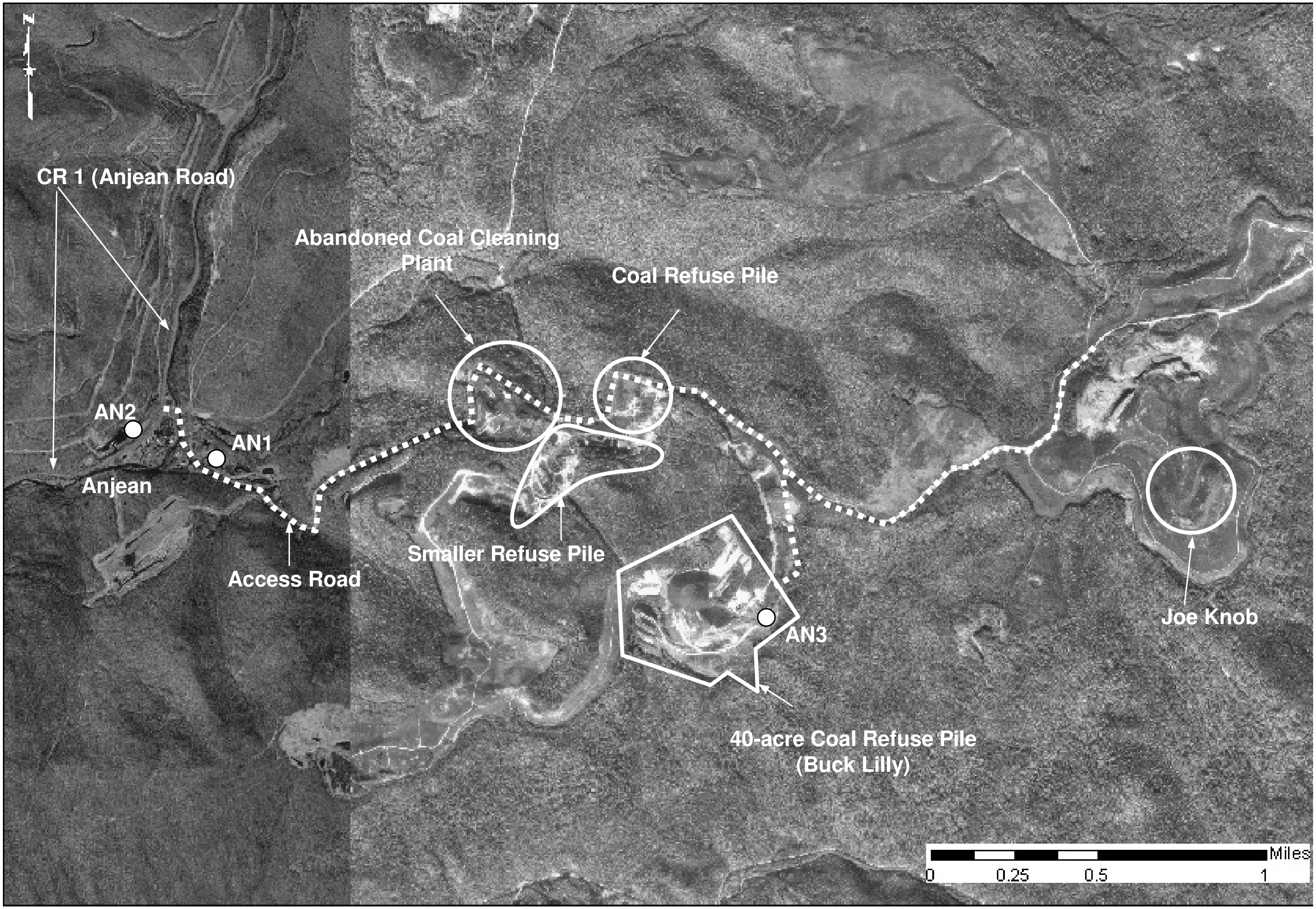

Figure 2.2-16.
Aerial Photo of Anjean/Joe Knob and Site Features
Map Source: USGS orthophoto map (1:12,000) Quinwood SE (1997) and Duo SW (1990)

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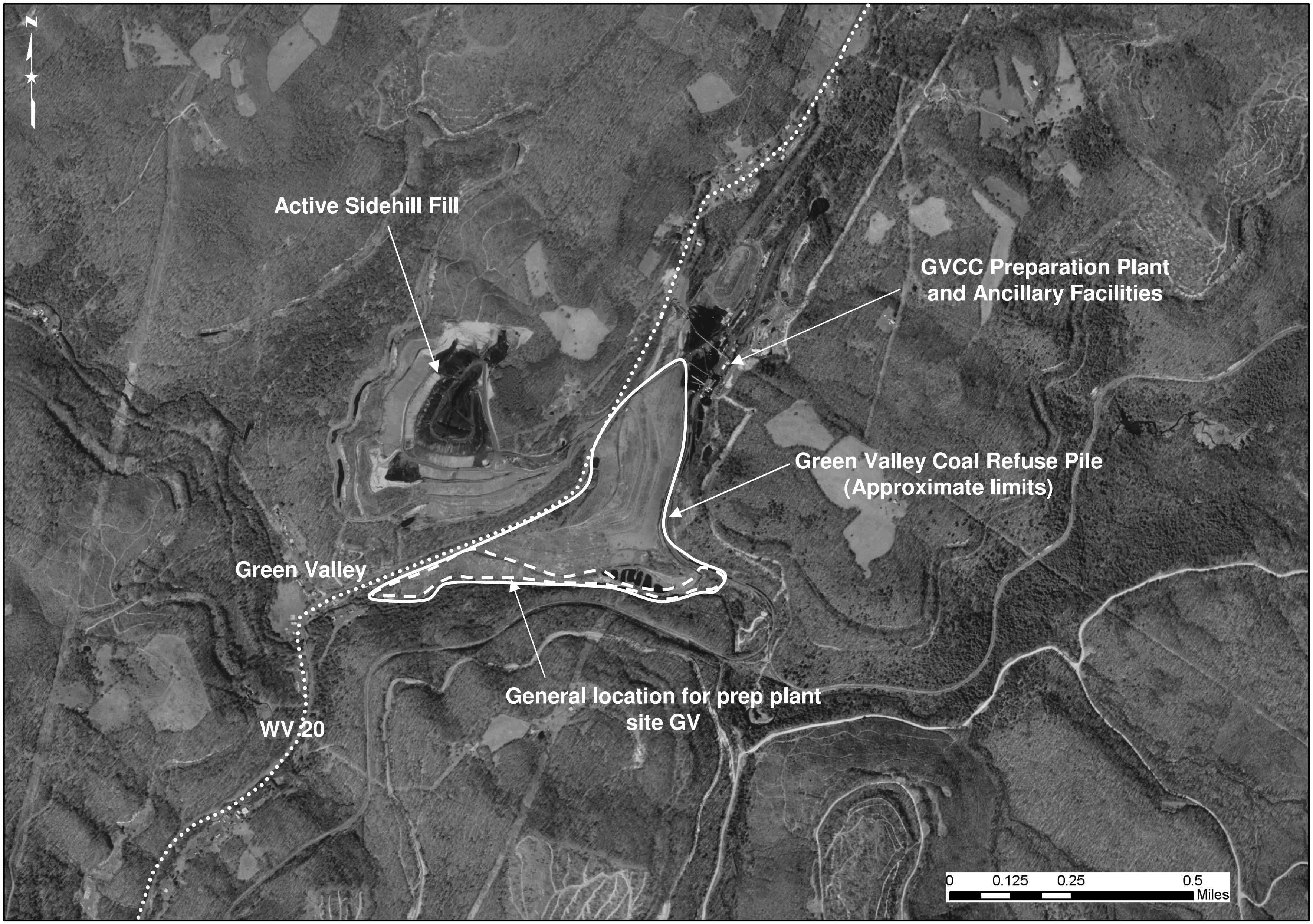

Figure 2.2-17.
Aerial Photo of Green Valley and Site Features
Map Source: USGS orthophoto map (1:12,000) Quinwood NW and Quinwood NE (1997)

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Figure 2.2-18.
Aerial Photo of Donegan Site
Sources: USGS DOQQ map (1:12,000) Richwood SW (1995)

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2.2.4 Limestone Sources

The proposed facility will require limestone for sulfur removal in the boiler operations and for a kiln that produces "clinker" as a raw material for cement production. Because the kiln requires a higher quality limestone than does the boiler, WGC evaluated several commercial sources for limestone supply, including the Boxley Quarry in Alta and the Savannah Lane, Greystone, Fort Springs, and Mill Point quarries (see Figures 2.2-1 and 2.2-19). WGC also considered the use of lime kiln dust to serve as the source of calcium oxide, versus limestone, for the kiln operations. Lime kiln dust could be obtained from sources located in Virginia or from shipments received via barge in Charleston, West Virginia. Potential sources of limestone are described further in Section 2.4.5.

Figure 2.2-19. Typical Quarry Site (Greystone)

2.2.5 Water Sources

The principal sources of water for the plant process would include treated effluent from the Rainelle Sewage Treatment Plant (RSTP) supplemented by water withdrawn from the Meadow River and/or from local groundwater wells. These potential water sources are described in Section 2.4.6. A water pipeline would convey treated effluent to the WGC site from the RSTP, which is located at the confluence of Sewell Creek and the Meadow River. The proposed corridor for the water line would primarily follow existing pipeline easements held by the Public Service District #2 (PSD#2) to the site as depicted in Figure 2.2-3. Depending upon the availability of customers, steam lines may also be extended along the water line corridor and could potentially be routed to industrial users in the EcoPark or elsewhere in the immediate vicinity of Rainelle.

2.2.6 Material Transportation

Several material streams would be transported to and from the plant on a day-to-day basis. On the input side, the largest material sources would be the CFB fuel and limestone needed for sulfur removal and kiln operations. Initially, coal refuse would be transported off road from Anjean/Joe Knob, then Donegan, and finally Green Valley to the respective prep plant site servicing the coal refuse pile. The resulting beneficiated coal refuse would be transported to the CFB plant site using equipment and routes described in Section 2.4.7. As these fuel sources are depleted, other coal refuse sites would be used as identified by WVDEP within the 30-mile (50-kilometer) radius of Rainelle. The most likely sites are located along either WV 20 or US 60 (see Figure 2.2-4).

Limestone sources are generally located in the vicinity of Lewisburg. Other inputs delivered on a smaller scale would include aqueous ammonia for NO_x reduction at the power plant, an alumina source, and a gypsum source. There are several options under consideration by WGC for transportation of coal refuse and limestone as described in Section 2.4.7. Delivery of other materials would be the responsibility of the respective commercial suppliers.

On the output side, the largest waste streams requiring transport from the site would be fly ash and bottom ash generated by the boiler, along with smaller amounts of general solid wastes. Marketable outputs could include cement and other ash byproducts from the EcoPark. A portion of the bottom ash would be transported to the clinker kiln as raw material for the cement manufacturing facility. The fly ash and excess bottom ash not required for cement production would be returned to the coal refuse sites in the trucks that delivered the beneficiated coal refuse. WGC would contract for the collection and disposal of general solid wastes. Distribution of ash byproducts to market and collection of general solid wastes for EcoPark facilities would be the responsibility of the respective organizations.

2.2.7 Power Transmission Corridors

The WGC Co-Production Facility would produce electricity for distribution on the national power grid. An existing American Electric Power (AEP) transmission corridor right-of-way (ROW) is located approximately 4,000 feet (1,220 meters) west of the proposed WGC power plant site (see Figure 2.2-3). Initial WGC plans included connecting at this point on the power network via a proposed transmission line that would cross WV 20, traversing in a northwesterly direction. However, as project planning and coordination with PJM (Pennsylvania Jersey Maryland) Interconnection progressed, it was determined that the electrical capacity of the existing AEP transmission lines was not sufficient to support the load from the plant without substantial upgrades in both directions. As a result, network reinforcements were considered too costly for this approach to be viable.

Current plans provide for an interconnect point at the Grassy Falls substation, which is approximately 18 miles (29 kilometers) north of Rainelle. Transmission corridor options under consideration by WGC are described further in Section 2.4.8.

2.2.8 Land Exchange

The proposed transmission corridor from the Co-Production Facility site to the existing AEP transmission line traverses approximately 17 acres (7 hectares) of land owned by the City of Rainelle. The property ranges from 300 to 500 feet (90 to 150 meters) in width and is approximately 2,000 feet (600 meters) in length from east to west. This land has been set aside for recreational and other public uses, and it includes a small picnic area that abuts WV 20 and the Greenbrier Hills Golf Club. Because public funds for open space recreation were used to reserve this property, the land cannot be used for a transmission corridor unless it is acquired and replaced with like property. As a result, WGC has worked with a local property owner, Plum Creek Timberlands, L.P., which has agreed to acquire the property and provide alternate property in exchange (i.e., the “exchange property”). The exchange property is located between the AEP transmission line and US 60, immediately west of the Rainelle golf course (see Figure 2.2-3).

2.3 Process and Technology Description

This section provides an overview of the technologies proposed as part of the WGC Co-Production Facility. In the most general terms, the proposed plant would burn coal refuse to generate steam for the purpose of driving a turbine to produce electricity. The co-production aspect refers to the production of electricity while simultaneously producing cement.

2.3.1 Circulating Fluidized-Bed

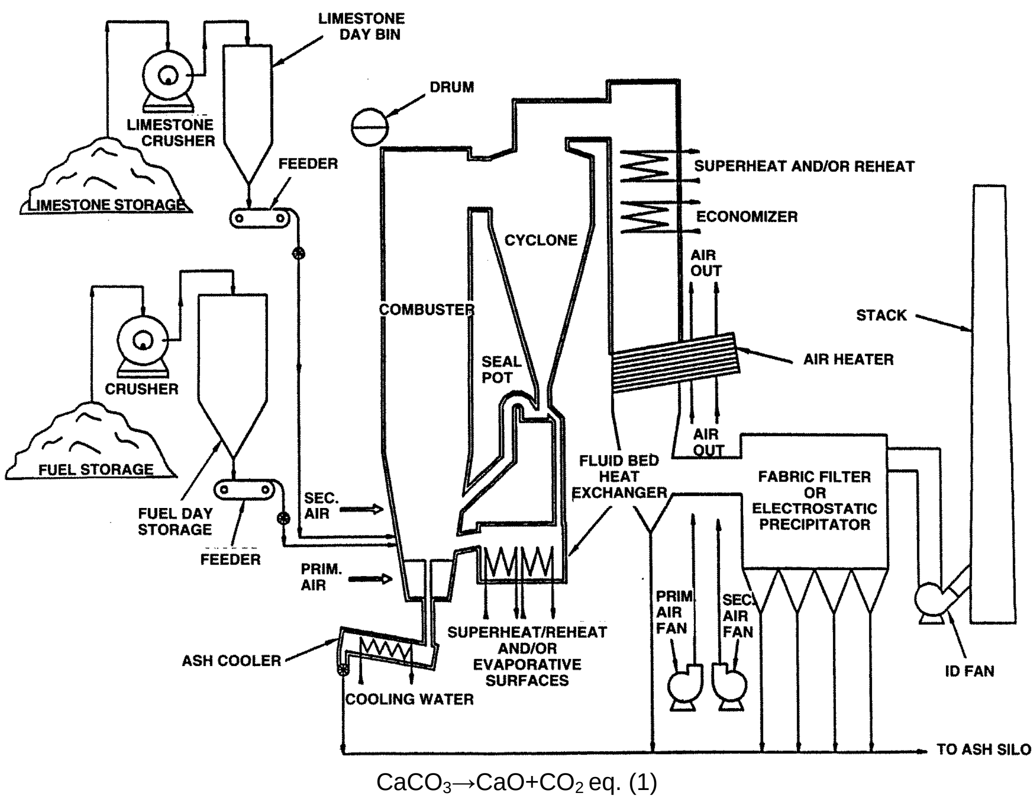
Fluidized-Bed Combustion (FBC) boilers use some form of particulate matter, typically coal ash or limestone, to make up a “bed.” Combustion air is passed through the bed causing the particulates to become partially supported by the air resulting in a suspended mass that behaves like a fluid. When fuel (e.g., coal or coal refuse) is burned in this bed, the combustion process can be carefully adjusted to limit emissions by controlling bed parameters. In addition, various sorbents, such as limestone, can be added to the bed to capture pollutants that would otherwise be emitted from the stack.

In general, FBC boilers can be divided into two types: bubbling fluidized-bed (BFB) boilers and circulating fluidized-bed (CFB) boilers. The BFB boilers operate at low air velocities, which results in the bed particles remaining in the bed. The CFB boilers operate at velocities that are 3 or 4 times those in a BFB, which results in the bed particles being carried out of the boiler with the combustion gases. Thus, in a CFB the bed materials must be continually replenished or “circulated” back into the boiler. This recirculation is achieved by separating the larger particles from the gas stream, typically by using a cyclone separator (WGC, 2002).

In the United States, CFB technology has been utilized in a broad spectrum of qualifying facilities and independent power projects since the 1980s. The CFB process facilitates power production while firing a wide range of fuels, and while meeting stringent emission limits. ALSTOM Power has been selected by WGC to provide the CFB design for the proposed Co-Production Facility. Over the past 5 years, ALSTOM Power has supplied 20 CFB steam generator systems utilizing the licensed process technology from Lurgi GmBH. Within the last three years, ALSTOM Power has successfully commissioned eight reheat CFB projects.

Figure 2.3-1 presents a typical flow schematic of an ALSTOM Power CFB steam generator (courtesy of ALSTOM Power). Combustion in a CFB system takes place in a vertical waterwall chamber called the combustor, the lower part of which is protected from erosion by refractory. The fuel and sorbent are fed into the combustor, fluidized, and burned at temperatures of 1,550-1,650 degrees Fahrenheit (°F) (840-900 degrees Celsius). The sorbent is fine-grained limestone, which reacts with the sulfur dioxide released from burning the fuel to form calcium sulfate (anhydrite). The solid anhydrite is removed through ash drains in the combustor floor or is collected in the particulate removal system.

The bed material in the combustor consists primarily of mineral matter from the fuel, anhydrite, and excess calcined lime. The main particle size of the bed material is in the range of 50-300 microns. The suspended solids form a pressure gradient along the height of the combustor, which decreases gradually toward the outlet at the top. The combustion gas entrains a considerable portion of the solids inventory from the combustor. Solids are separated from the gas in one or more recycle cyclones and are continuously returned to the bed via a recycle loop. A controlled amount of solids from the cyclone(s) can also be passed through an external fluidized-bed heat exchanger (FBHE) and returned to the combustor. The high internal and external circulating rates of solids, characteristic of the CFB, result in uniform temperatures throughout the combustor and the solids recycle system.



$CaCO_3 \rightarrow CaO + CO_2$ eq. (1)

$2SO_2 + 2CaO + O_2 \rightarrow 2CaSO_4$ eq. (2)

Figure 2.3-1. Typical ALSTOM Power CFB Steam Generator (schematic and generic description provided courtesy of ALSTOM Power)

Because of the differences in velocity between gas and solids, the solids proceed through the combustor at a lower velocity than the gas. The long residence and contact times, coupled with the small particle sizes and moderate-to-high gas temperatures result in high combustion efficiency. These conditions also allow for the decomposition of the limestone and the subsequent capture of the SO_2 at relatively low calcium to sulfur molar (atomic) ratios.

Combustion air is fed to the combustor at two levels. Roughly 40 percent of the combustion air is introduced as primary or fluidizing air through the grate at the bottom, and the balance is admitted as secondary air through multiple ports along the combustor front, rear and side walls. Combustion thus takes place in two zones: a primary reducing zone in the lower section of the combustor followed by complete combustion using excess air in the upper section. This staged combustion, at controlled temperatures, effectively controls NO_x formation.

The primary loop is where heat is removed from the solids circulating in the CFB system. Heat removal is achieved by:

- Heat-absorbing surface in the waterwalls of the combustor.
- Additional heat-absorbing surface, if necessary, located in the FBHE.
- The convective pass (backpass), where heat is removed from the flue gas exiting the recycle cyclone.

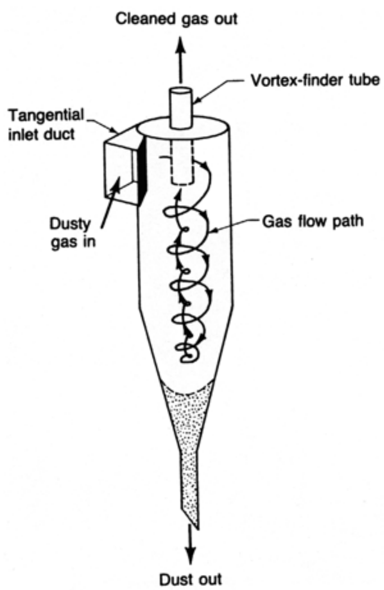
Typically, after the convective pass, the gases are further cooled in an air preheater. After the air preheater, the flue gases are cleaned in a baghouse or electrostatic precipitator and vented via an induced draft fan to the stack.

2.3.2 Integrated, Inverted Cyclone – Mid-Support (I^2CMS) Design

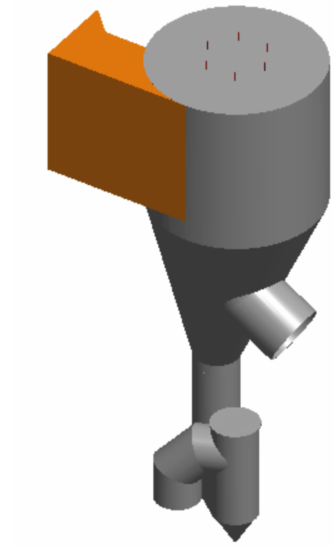
Centrifugal or cyclone collectors are widely used for removing particulate matter from gas streams. These devices normally consist of a cylindrical shell with a tangentially aligned inlet duct that directs a particle-laden gas into a cylinder with a funnel-shaped bottom and a gas outlet tube at the top (see Figure 2.3-2). As the gas spirals downward around the cylinder walls, the particles are forced to the cylinder walls where gas velocities are lower, and through gravitational forces the particles migrate to the bottom of the cyclone where they are captured in a hopper or other similar device. The cleaned gas is then directed out of the top of the cylinder through an outlet tube.

A key feature of the WGC Project, for technology demonstration purposes, is the use of ALSTOM Power's inverted cyclone (I^2CMS) design versus a typical or conventional cyclone design. In concept, the I^2CMS operates under the same principles as a conventional cyclone with a very simple and straightforward difference. In the I^2CMS, the cleaned gas exits from the bottom of the cyclone versus the top of the cyclone (see Figure 2.3-2). The bottom is configured as an eccentric funnel to enable the gas outlet duct to extend vertically up into the center of the cyclone body.

Overall, the I^2CMS retains many of the same inherent design parameters as the conventional cyclone. However, the change in where the gas stream exits has a dramatic impact on the arrangement of other CFB components, resulting in the primary benefit of achieving a substantially smaller configuration. In addition, the I^2CMS design provides additional reduction in the configuration size by allowing a mid-support structural system to be employed, as opposed to a conventional top support system. Collectively, the I^2CMS design structure can result in a reduction of up to 60 percent in structural steel weight and 30 percent to 40 percent of the primary structure footprint and height over conventional systems. Thus, this technology provides substantial cost and space savings. Figure 2.3-3 illustrates the reduced profile of the I^2CMS boiler. While the inverted cyclone design has been used successfully on small power plants in China, it has never been demonstrated in the U.S.

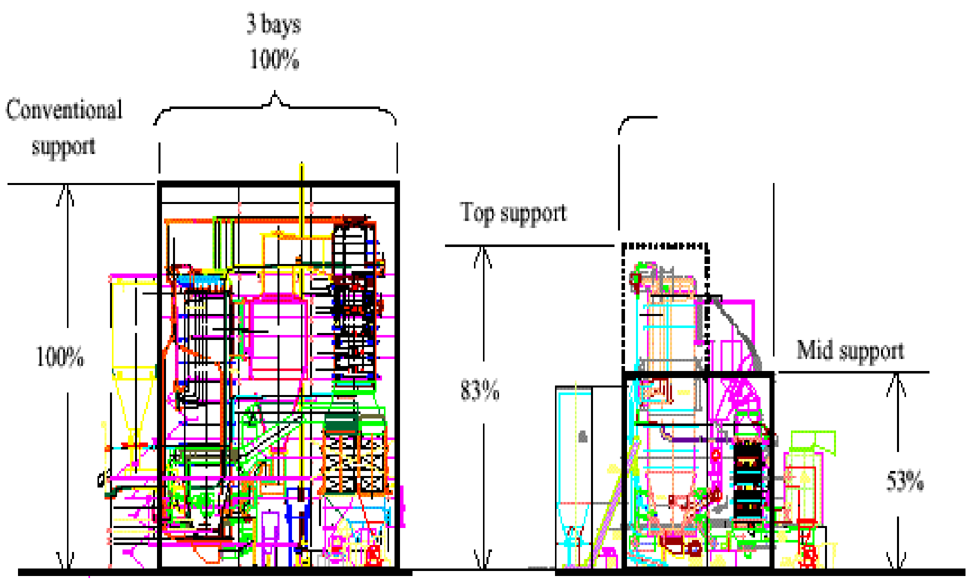


Conventional Cyclone Design (Alley & Cooper, 1994)



Inverted Cyclone Design (ALSTOM)

Figure 2.3-2. Comparison of Cyclone Designs



Conventional **I²CMS**

Figure 2.3-3. Comparison of Boiler Profiles

2.3.3 Flash Dryer Absorber

The flash dryer absorber (FDA) consists of a reactor vessel, a particulate capture device, and a mixer that was developed to reduce the SO_2 levels in a flue gas stream (Figure 2.3-4). SO_2 is controlled by treating some of the fly ash with water, and re-injecting the mixture back into the flue gas stream. For this CFB application, CaO is created in the furnace and ejected with the fly ash, so a lime injection system is not required and is not included as part of the process. The reactor vessel provides contact between the combustion gases leaving the CFB and a stream of wet solid particles laden with CaO (WGC, 2005d). A specially designed pulse jet fabric filter (OPTIPULSE® LKP) removes the particulates from the flue gas prior to the discharge of the gas to the atmosphere.

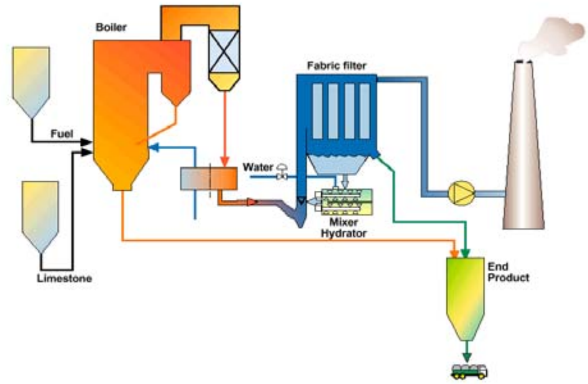


Figure 2.3-4. DFGD FDA Concept for Fossil Fuel CFB Application

2.3.3.1 Absorbent

The CFB FDA system uses the residual alkali (CaO) available in the CFB fly ash, and thus lime absorbent, a lime-handling system, and any slaking equipment are not required.

2.3.3.2 Absorber Operating Temperature/Absorption Mechanism

The amount of water fed into the FDA system is dependent on the desired temperature difference between incoming and outgoing gas across the FDA reactor (the cool down): the larger the cool down that is desired, the greater the amount of water that must be evaporated to cool the flue gas. The water partially reacts with the CaO to form $Ca(OH)_2$.

SO_2 is a relatively slow-reacting component of flue gas. By keeping the reactor outlet temperatures low, the individual particles retain a wet film on the surface for a longer time, which promotes the reaction between SO_2 and $Ca(OH)_2$.

2.3.3.3 Mixer

The mixer accurately blends recycled powder and water in controlled ratios to achieve the desired gas outlet temperature and the required removal efficiency. The unique design of the mixer provides excellent mixing and a homogenous product with even water distribution. The intense mixing action and long residence time in the mixer enhances the utilization of the residual alkali in the fly ash. The system lends itself ideally to activation of the alkaline ash produced in limestone-charged CFBs. This design is based on decades of experience from ash humidifiers used in various processes (see Figure 2.3-5).

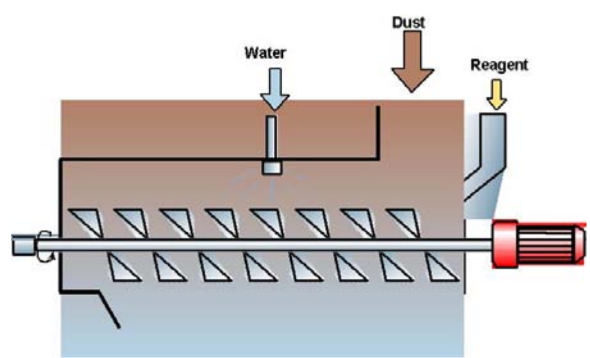


Figure 2.3-5. Mixer

2.3.3.4 FDA Reactor

The goal of the reactor is to ensure an optimal distribution of the absorbent across the flue gas duct cross-section so that SO_2 removal is maximized. The reactor is designed to create adequate turbulence for efficient mixing of gas and absorbent over the entire load range. The FDA system features a two-point waste ash discharge system. Waste ash can be discharged from the bottom of the FDA reactor and from the fabric filter. A two-point discharge system is advantageous because it avoids potential blockage of the gas path. Normally, the FDA system does not require exhaust gas reheat.

2.3.3.5 Dust Collector – Fabric Filter

A pulsejet fabric filter located downstream of the reactor collects the mixed ash formed during the absorption process as well as the fly ash present in the flue gas. The pulsejet fabric filter is an ALSTOM Power LKP OPTIPULSE® unit with a central inlet plenum. The LKP has been widely accepted in industrial applications, and the design is the most widely used pulsejet collector for coal-fired utility boilers around the world. The LKP design is characterized by the following:

- Heavy industrial design for reliability and durability
- Maintenance from the clean side
- Powerful cleaning system for on-line automatic bag cleaning

The LKP filter has proven its capability of achieving low dust emissions in a multitude of applications.

2.3.4 Selective Non-Catalytic Reduction

Selective Non-Catalytic Reduction (SNCR) systems can be used to reduce the emissions of nitrogen oxides. The SNCR process is based on the injection of ammonia into the combustion gas stream. A metering module serves to deliver an accurately measured amount of reagent to the injectors, which enables the treatment rate of the system to be controlled. The metering module also controls dilution water flow and pressure. Compressed air from the plant service air system is used for atomization of the ammonia and cooling of the injectors. The potential NO_x reduction is sensitive to the temperature of reaction and time available for the NO_x reducing reaction to occur. The injectors would be located in the particle separator outlets where the required temperatures exist for the SNCR reaction. Final injector quantities and locations would be determined by computer modeling to ensure proper distribution of reagent.

A usage rate of approximately 45 gallons per hour (170 liters per hour) of aqueous ammonia (28 percent solution) is anticipated. Safety features for the handling of aqueous ammonia would include:

- Storage in a single 15,000-gallon (56,800-liter) carbon-steel, registered pressure storage tank that would have a maximum working volume (90 percent) of 13,500 gallons (51,100 liters) and provide 14 days of storage.
- Location of the tank within a 612 square foot (57 square meter) diked concrete containment area (sufficient to hold the contents of the tank).
- Transfer of aqueous ammonia from a tanker truck through a liquid-filled connection supported by a bulkhead containment wall designed to withstand the force arising from a tanker truck pulling away while still connected. Emergency shut-off valve in the event of an accidental pull-away of a truck or a hose rupture.
- Secondary containment for the tanker truck unloading area to capture any potential spills and prevent migration to soil or groundwater.
- Unloading during daylight hours on weekdays only, with procedures requiring the operator to remain with the truck until unloading is complete.
- Continuous monitoring of the tank level, including a high-level alarm at 90 percent of maximum capacity.
- Excess flow valves mounted on all storage tank liquid lines designed to detect a sudden drop in pressure due to the release of ammonia through an opening equivalent to the diameter of the liquid ammonia line and to stop its flow.
- Implementation of a detailed emergency response/spill control plan.
- Spill response equipment provided near the tank and truck unloading areas.

2.3.5 Kiln Facilities

The WGC Project integrates a kiln facility with the 98-MWe (net) CFB power plant as illustrated in Figure 2.3-6. The kiln converts waste ash materials produced by the CFB, purchased limestone or other calcium source, alumina, and gypsum to produce up to 100 short tons (st) (90 metric tons) per day of a cement material that can be used in construction and in the manufacturing of building products. Production rates for the cement material would be dependent upon the size of the kiln that WGC ultimately procures. A kiln that could produce up to 100 st/day (90 metric tons/day) represents the production rate of the largest kiln that might be used and is presented as the upper bound for purposes of this EIS. WGC's air permit currently limits production to 75 st (68 metric tons) per day; however, WGC may request a permit amendment based on the final kiln size. ***The completed WGC kiln preliminary design provides a capacity in the range of 50 to 75 tons per day. WGC originally planned on using a larger kiln; however, the current design would require a maximum of 75 tons per day. Therefore, the analysis provided in the Draft EIS provides conservative estimates as the 75 tons per day limit would not be exceeded.***

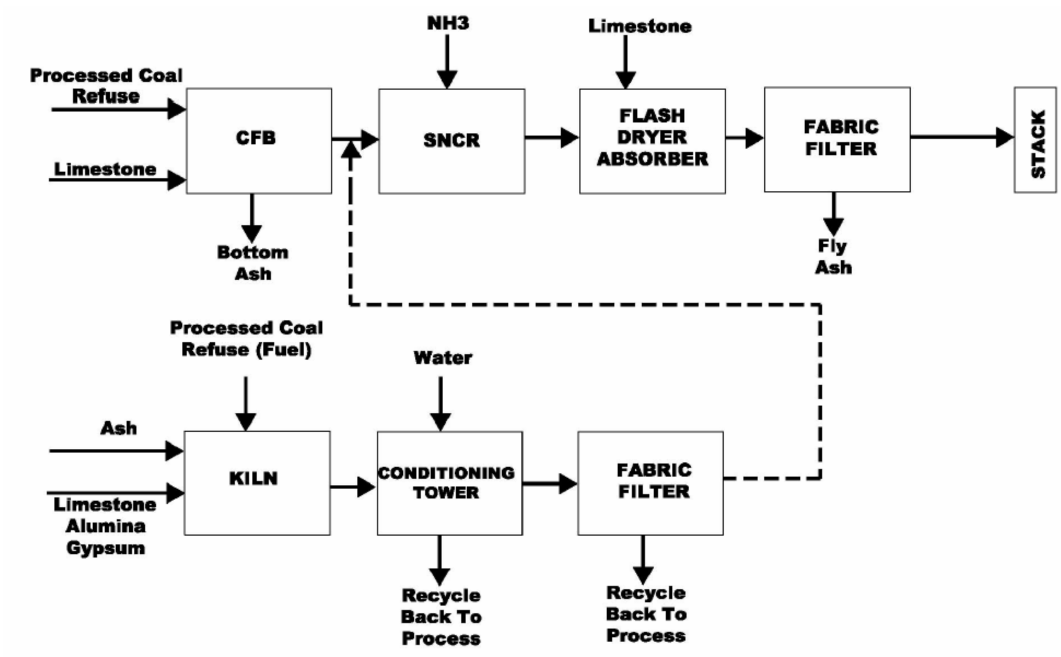


Figure 2.3-6. Kiln Process Flow Diagram

2.3.5.1 Kiln Raw Material Handling and Storage

The raw material handling and storage facilities would receive the following approximate quantities of materials based on a kiln with a maximum capacity of 100 st/day (90 metric tons/day). These represent the upper bounds of materials that would be received, handled, and stored at the kiln facility:

- 20 st/day (18 metric tons/day) of bottom ash transferred from the CFB.
- 72 st/day (65 metric tons/day) of limestone received from area quarries.
- 25 st/day (23 metric tons/day) of gypsum slurry received as a waste product from a coal-fired power plant scrubber in West Virginia (stored in an agitated tank).
- 13 st/day (12 metric tons/day) of a commercially procured alumina (stored in a separate silo).

The gypsum slurry would be mixed with the other constituents to form a damp but conveyable mixture. Conventional dust collection systems and bin vents would control dust emissions generated as the raw materials are handled and stored by conveyors, pipes, feeders and bins.

2.3.5.2 Raw Grinding and Blending

All raw materials (bottom ash, limestone, alumina source, and gypsum slurry) would be conveyed together to the raw grinding and blending area. The mixture (raw mix) would be ground to a fine powder in an airswept ball mill. Mill product (raw meal) would be classified and pneumatically conveyed to a 600-st (540-metric ton) capacity storage and homogenization silo. Homogenized raw meal would be pneumatically conveyed to the kiln system, where the meal would be heated causing a chemical change to form a material with the desired chemical and physical properties, known as "clinker." The thermal-based kiln system would consist of a pre-heater, calciner, rotary kiln, and clinker cooler.

2.3.5.3 Kiln Fuel System

High-quality coal fines from the coal refuse beneficiation process would provide the approximately 16.7 million BTU/hr thermal energy required to produce clinker. The thermal energy would be supplied by firing pulverized high-quality coal fines in the kiln burner. High-quality coal fines would be delivered to the kiln material handling system, de-lumped, and then transferred to a 100-st (90-metric ton) capacity coal storage bin. The coal fines would be further pulverized, if required, in an air-swept vertical mill and transferred pneumatically to the burner. A direct firing system would mix combustion air with the pulverized coal and pass the combustible mixture into the kiln burner. Approximately 17 st/day (15 metric tons/day) of beneficiated coal would be fired in the kiln burner.

2.3.5.4 Kiln System

Raw meal would be fed to a long, dry kiln to form the clinker. Hot kiln gas, comprised of excess air, combustion gases, and carbon dioxide produced by the calcining process, would exit the kiln and be cooled in a spray tower, filtered in a baghouse, and the flue gas vented into the boiler inlet air feed to remove any residual sulfur dioxide and kiln NO_x from the gas stream. The combined, cleaned flue gases would be discharged to the power plant stack. To provide added flexibility and control, the exhaust from the kiln would be combined with the CFB exhaust after the CFB baghouse. The kiln system also provides the option of ducting kiln gases directly to the power plant stack following the kiln baghouse; however, this option would only be used if directing the kiln's exhaust into the CFB is unsuccessful. Air emissions would be within permit limits whether or not gases from the kiln would be directed to the CFB system or directly to the air stack. The hot clinker formed in the kiln would pass into a grate-type, air-swept cooler. The air would cool the clinker from about 2,300°F to 250°F (1,260^{o}C to 120^{o}C).

2.3.5.5 Finish Grinding

Cooled clinker would be conveyed to a 210-st (190-metric ton) capacity clinker storage bin, where the cooled clinker would be withdrawn as needed and conveyed to an air-swept ball mill for grinding. The grinding mill product would be collected and stored prior to delivery for an end user.

2.3.5.6 Ash Byproduct Manufacturing Facility

An ash byproduct manufacturing facility is considered to be a likely tenant on the planned EcoPark. Although this facility is not part of WGC's action and most likely would be independently owned and operated, consideration has been given to such a facility as part of the Co-Production Facility Design Process. Thus, conceptual layouts for such a facility are included in the Co-Production Facility layout drawings presented in Figures 2.4-1 and 2.4-2

2.3.6 Fuel Processing/Beneficiation

As stated in Section 2.2.3, WGC proposes to procure services for crushing, sizing, and beneficiation of coal refuse by a third party at a prep plant to be located at or near the coal refuse source. The prep plant system incorporates a heavy media (HM) cyclone and super spiral technologies that can process 250 tons/hr (230 metric tons/hr) of coal refuse in a modular design that can be disassembled, relocated, and reassembled. The design incorporates the following circuits and functions:

- HM cyclone separation;
- Super spiral fines circuits ;
- Iron pyrite removal feature (>50 percent reduction expected in reject material blend);
- State-of-the-art process controls;
- Refuse mixing and neutralization using alkaline combustion ash; and
- Approximately 40 percent yield for WGC fuel specification.

Figure 2.3-7 shows a prep plant process flowchart. The process begins with the raw coal refuse being deposited into a feed hopper, conveyed to a crusher, and discharged into a sump below ground level as a water/slurry mix. This water/slurry mix is then screened to separate the denser materials from the lighter materials. The denser materials are conveyed to a HM cyclone for further separation. The desired product is conveyed from HM cyclone to the CFB fuel stockpile, and the rejected material is diverted for further processing in a splitter. The splitter divides the rejected material into useable product (conveyed to the CFB fuel stockpile) and final refuse.

Meanwhile, the lighter materials that were separated during the initial screening are conveyed to the primary classifying cyclones, where desired materials are separated and conveyed to spiral concentrators, and rejected materials are conveyed to the secondary classifying cyclones. The spiral concentrators separate the desired materials passed by the primary classifying cyclones into useable product (conveyed to the CFB fuel stockpile) and final refuse. The secondary classifying cyclones process the material rejected by the primary classifying cyclones to separate out the final refuse from potentially useable product. The potentially useable product is conveyed from the secondary classifying cyclones to a floatation circuit, which separates the concentrated product (conveyed to the CFB fuel stockpile) from the tailings (final refuse).

The refuse disposal constraints would be substantially simplified by the use of froth flotation to remove iron pyrite (>50 percent reduction target in the ash/reject blend as compared with the original coal refuse) and neutralization by free CaO in the blended combustion ash. WGC is currently investigating the feasibility of marketing the recovered iron pyrite as a product to third parties. If this material is not marketable, WGC would dispose of it in a landfill permitted to accept iron pyrite or would otherwise dispose of the material as agreeable by WVDEP for the remediation of the coal refuse piles.

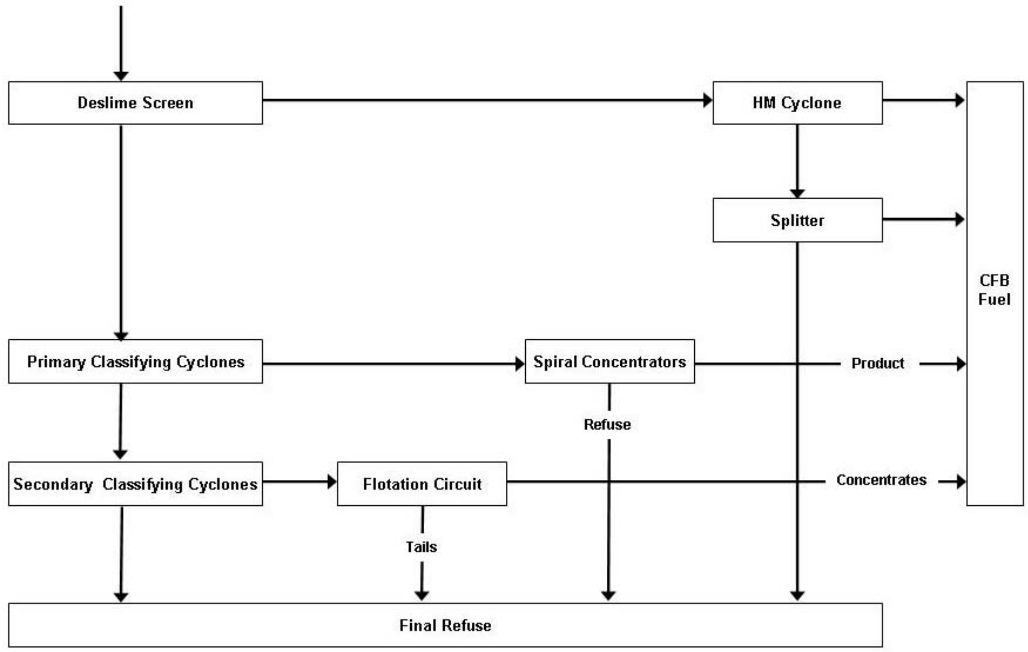


Figure 2.3-7. Prep Plant Process

The process would involve a close-looped circuit with a make-up water demand of less than 100 gallons per minute (380 liters per minute) and a power demand of less than 2,500 kW. The main advantage to this type of prep plant is the use of underground sumps, which significantly lowers the height envelope compared to typical coal prep plants. Because a large amount of equipment is required, traditional plants stacked the equipment floor by floor so that the media could be fed by gravity from one processing machine to the next in a building 50 to 85 feet (15 to 26 meters) tall. The new arrangement allows for a substantial reduction in height and noise, resulting in a building 15 to 25 feet (5 to 8 meters) tall.

2.4 WGC Project Planning and Considerations

This section describes each component of the WGC Project and the relevant aspects of these components from the perspective of the EIS. As part of its planning and design process, WGC has considered and evaluated numerous options with respect to key components of the WGC Project. It should be noted that WGC is in the preliminary design stage for this proposed project and that details of the project components described herein may be modified as the design progresses. In instances where there is still a degree of uncertainty with respect to a particular aspect of the project, discussion is provided on options that are currently available or being considered by WGC.

2.4.1 Power Plant and Facilities Siting, Layout, and Planning

The site selected for the power plant by WGC is principally located on the E&R Property as described in Section 2.2.1. The E&R property on the south side of Sewell Creek was selected by the municipalities based upon a number of considerations, including the availability of adequate site acreage with limited disturbance of wetlands, as well as concerns about economic, community, and surrounding land uses that were identified by WGC through numerous town meetings and discussions with community leaders. As part of the planning and conceptual design process, WGC considered a number of site layouts for the E&R Property, as well as several alternate sites that were removed from further consideration based on economic feasibility constraints or potentially adverse environmental impacts. Alternate sites given consideration included the proposed EcoPark property and sections of the Plum Creek property immediately southwest of the E&R property. WGC also considered the use of the CSXT property located between Sewell Creek, Wolfpen Creek, and WV 20 as a potential site for coal handling facilities.

Final consideration was given to the three siting and layout options that included constructing the facility on the E&R property and adjacent lands. These options are differentiated by two primary characteristics, including the size of the facility footprint on the E&R property and the potential use of a rail spur within the EcoPark (see Figures 2.4-1 through 2.4-3).

WGC and the design team gave careful consideration to each of these options, which included numerous iterations of a conceptual design. The team's principal concerns included financial ***and operational*** feasibility, impacts to the planned EcoPark and to other adjacent land uses, and environmental issues, such as the potential for impacts to wetlands, streams, and floodplains.

Of the siting and layout options considered, Option A is preferred by WGC and is the basis for planning and conceptual design. Option B ***and*** C ***are not considered*** feasible because of the degree to which these siting options would impact streams and wetlands, and because of financial concerns. As described further in Section 2.4.7, WGC determined that providing rail access to the site and to the coal refuse sites would not be economically feasible ***nor would it be practicable from an operational standpoint***. However, these options are discussed in the EIS for comparative purposes.

Option A would require the leveling of the previously cleared northeastern end of a ridge that is connected with Sims Mountain and that occupies the greater part of the site. The site grade would be raised from the existing base elevation of approximately 2,400 feet (730 meters) to approximately 2,420 feet (740 meters) above mean sea level. A small wooded area (approximately 2 acres [1 hectare]) of the ridge would be cleared and graded at a slope of approximately 45.5 percent to the south and west of the ridgeline. Based on geotechnical studies, WGC has determined that the grading operations would be accomplished mainly using heavy equipment; however, a limited amount of blasting may be necessary to reduce consolidated bedrock. To support construction, a temporary access road and bridge would be constructed to the south of the Park Center Shopping Complex, extending from John Raine Drive and crossing Sewell Creek to the E&R property.

The facility layout would include all of the key technological components discussed in Section 2.3, including (also see Figure 2.4-4):

- Boiler/CFB
- Material Handling Area
- Cooling Towers
- Water Treatment Plant
- Exhaust Stack (approximately 300 feet [90 meters] high)
- Kiln
- Material Storage Areas

For illustrative purposes, the potential ash byproduct manufacturing facilities by a third party are shown in Figure 2.4-4; however, the site layout for these facilities is unknown at this time.

2.4.2 Site Access, Circulation, and Equipment

Access to the site from within the region would be via I-64 to US 60 and WV 20 connecting with local roads. Site access is substantially similar for each of the siting and layout options considered by WGC. The primary access for each of these layouts would be off of WV 20 onto Tom Raine Drive, through the EcoPark, and over a permanent bridge (to be constructed) that would span Sewell Creek to enter the site from the west. A secondary entrance for emergency vehicles would connect with Pennsylvania Avenue on the southeastern side of the E&R property. When considering potential entrances to the site, and the location of the bridge that would cross Sewell Creek, consideration was given to potential traffic flow, stream, wetlands, and floodplain impacts from the WGC facility. Also, to the greatest extent practicable, WGC has designed internal site circulation to minimize the need for backing up of trucks and other heavy vehicles, thereby improving safety and reducing noise from back-up warning devices.

Materials handling for the power plant would occur on the southern and western portions of the site, which are the most distant from nearby residences. Delivery trucks would proceed to the 2-day processed fuel storage pile or the 3.5-day limestone storage pile, as appropriate. Fuel trucks would be on site for approximately 10 minutes each, and limestone trucks for approximately 5 minutes each. Deliveries of fuel and materials would occur as described in Section 2.4.7, and the subsequent transfer of materials to the coal and limestone preparation buildings would occur 24 hours per day by front-end loaders and conveyors. Front-end loaders would be used to remove material from a pile (fuel or limestone) and deliver it to the appropriate feeder, which would then transfer the material to the conveying system.

The following is a list of the principal material handling equipment expected to operate at the plant site:

- Hauling – On-road tractor (550 HP or equivalent)
- Fuel supply and wet ash return – 40-ton dump trailers
- Limestone supply – 20-ton dump trailers
- Fuel handling and ash loading – Cat 988G wheeled loader (or equivalent)

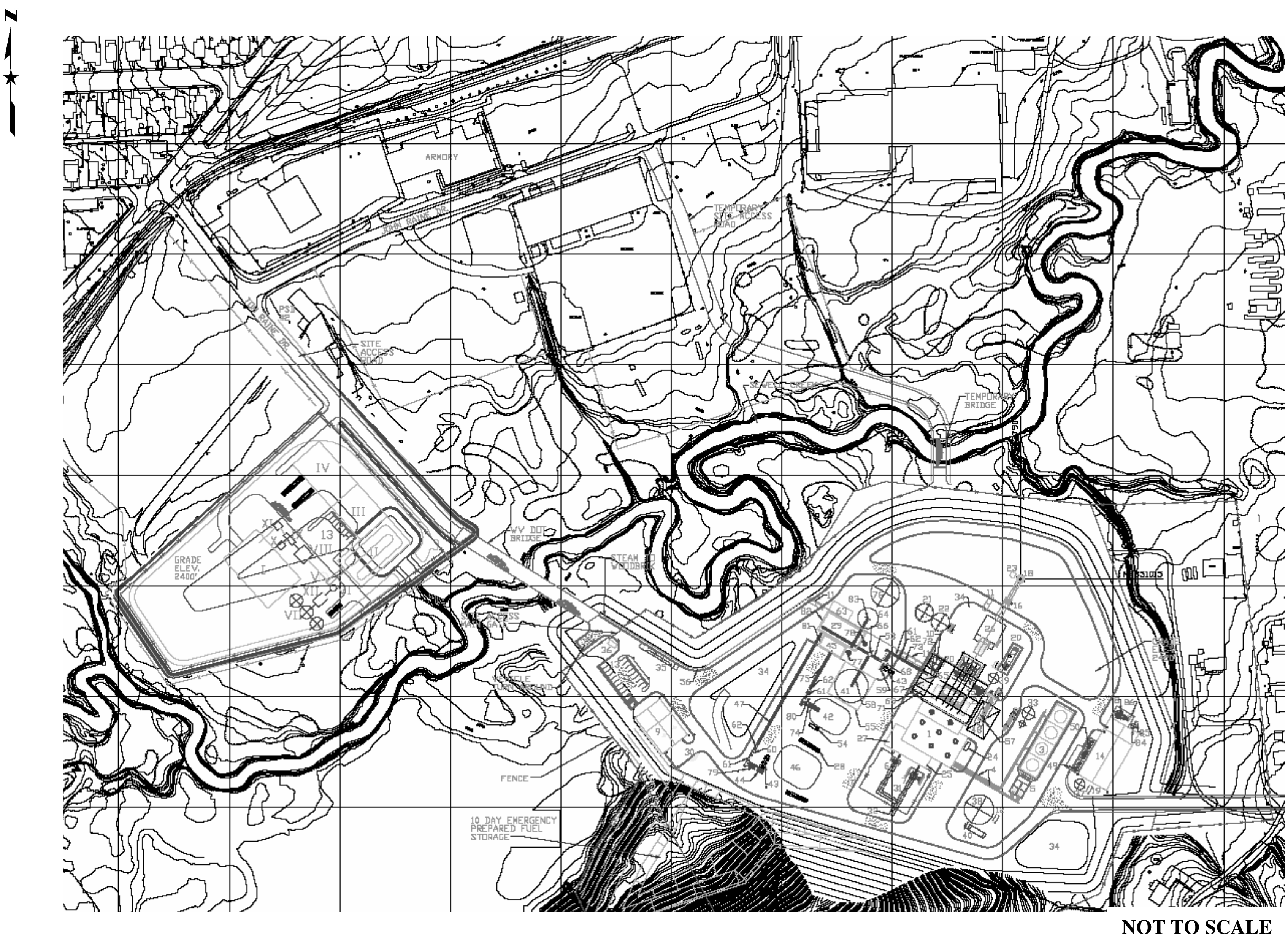


Figure 2.4-1.
Option A – E&R Property with Reduced Footprint

Sources: PEC 2006 Version A

U.S. Department of Energy
National Energy Technology Lab

Western Greenbrier Co-Production Demonstration Project

Environmental Impact Statement

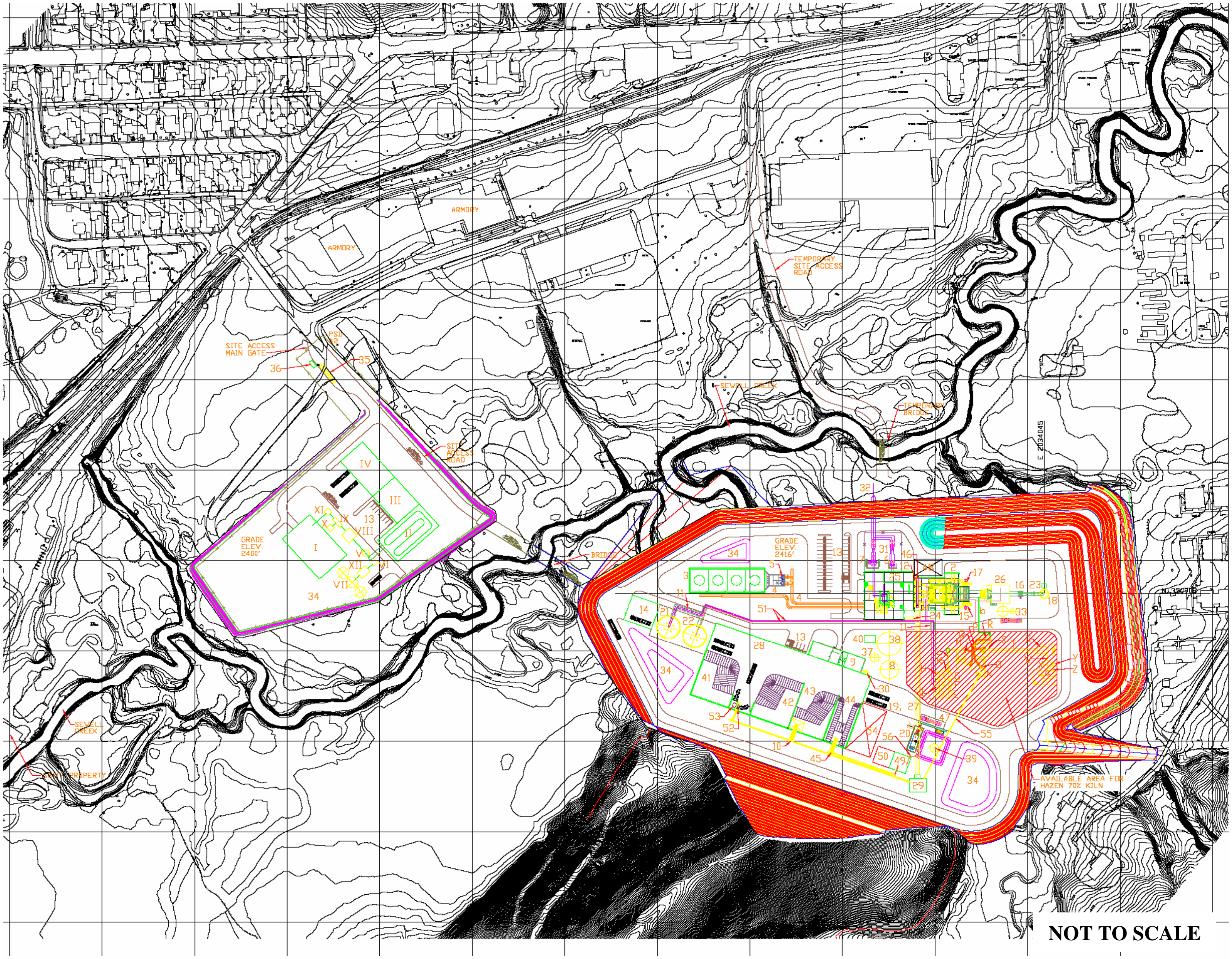


Figure 2.4-2.
Option B – E&R Property with Reduced Footprint

Sources: PEC 2006 Version A

U.S. Department of Energy
National Energy Technology Lab

Western Greenbrier Co-Production Demonstration Project

Environmental Impact Statement

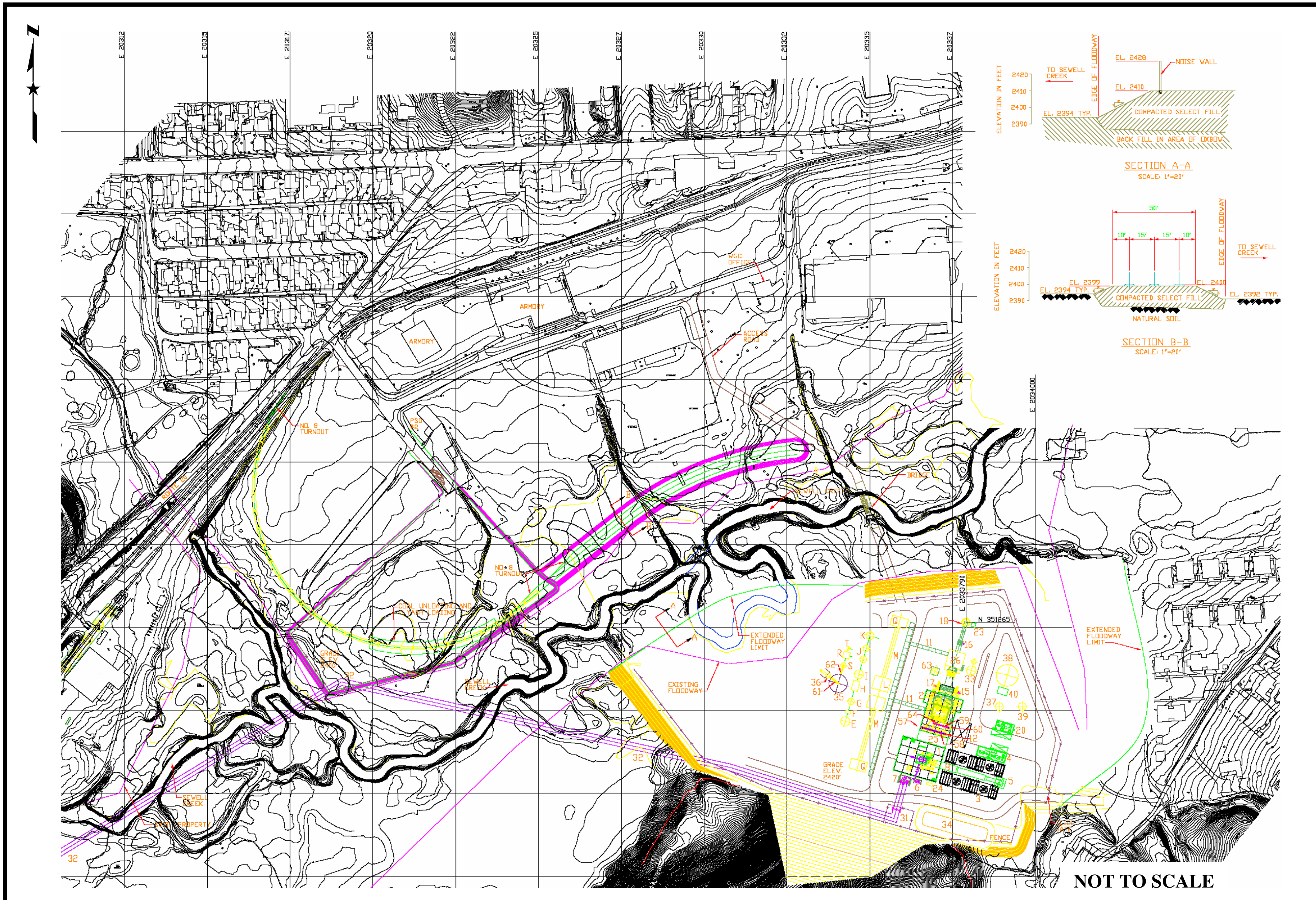


Figure 2.4-3.
Option C – E&R Property with Earthen Berm and Rail Spur

Sources: PEC 2006 Version A

U.S. Department of Energy
National Energy Technology Lab

Western Greenbrier Co-Production Demonstration Project

Environmental Impact Statement

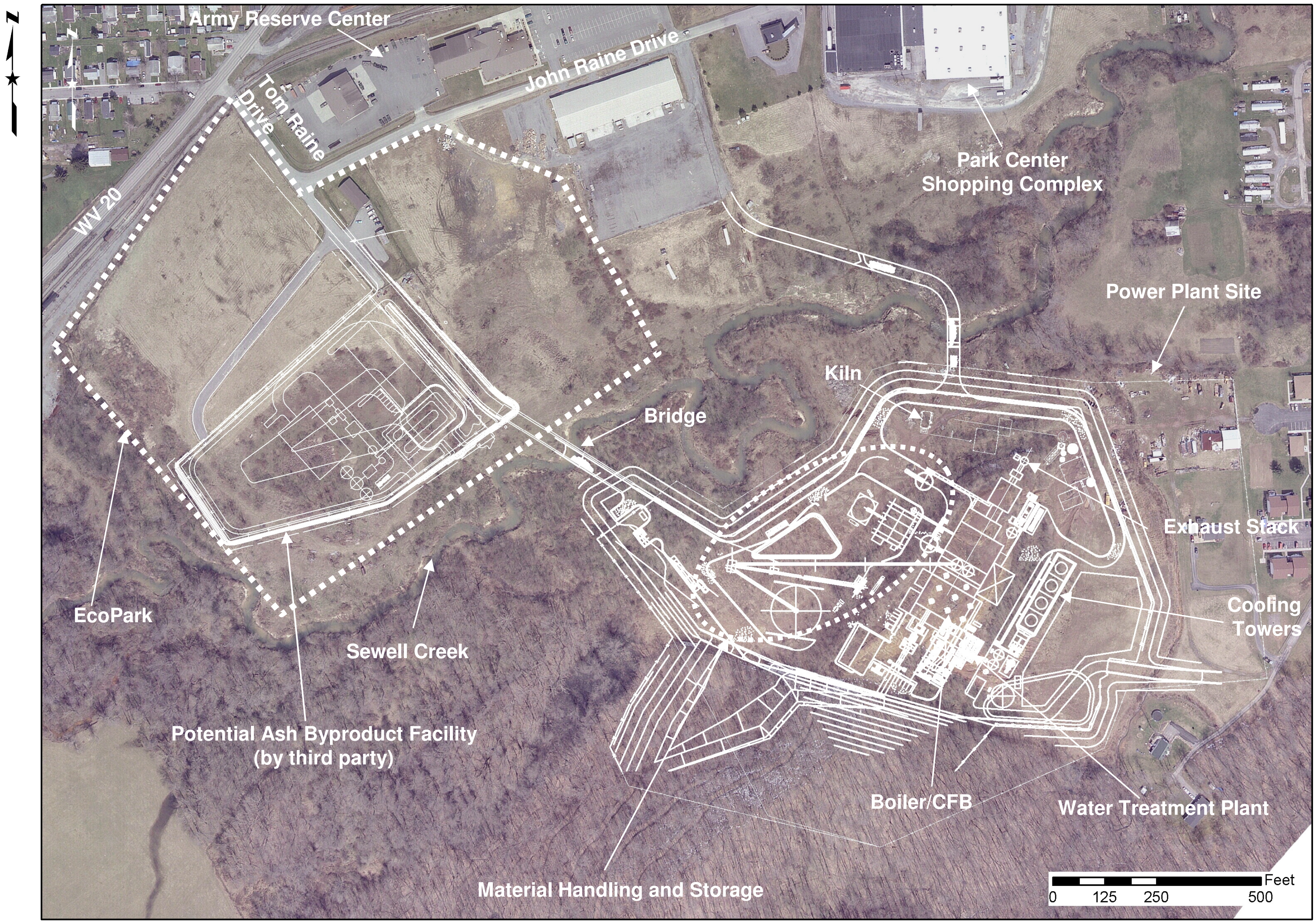


Figure 2.4-4.
Proposed Site Plan
Sources: Rainelle Aerial Map Source (2004); Power Plant Site Plan Rev D – CH2MHill/Lockwood-Greene, May 9, 2006; Kiln Layout – Hazen, 2005

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National Energy Technology Lab

Western Greenbrier Co-Production Demonstration Project

Environmental Impact Statement

WGC and WV Department of Highways (WVDOH) have discussed the prospect for WVDOH to extend Tom Raine Drive to the plant site and construct the necessary bridge for this extension. In this case, WGC, with WVDOH assuming the costs for maintenance, would be responsible for the design, construction, and maintenance of the structure. Public use of the bridge would be required if constructed using WVDOH funds. The bridge would be constructed in accordance with WVDOH guidelines and standards, which require that there would be no increase in upstream flood levels. Based on preliminary hydraulic analysis, WGC expects that the bridge would consist of three 100-foot (30-meter) spans 28 feet (9 meters) wide and 48 inches (122 centimeters) in depth, with two intermediate concrete piers 4 feet (1.2 meters) in thickness that would be aligned parallel with stream flow. The bridge would begin and terminate with a wall abutment that would include wingwalls on each side of the abutment to retain the approach roadway embankment. The approaches to the bridge would be constructed using material excavated from the power plant site.

A temporary road would be provided for site access during construction. It would extend southward from John Raine Drive and lead to a temporary, prefabricated bridge erected across Sewell Creek that would be constructed near the confluence of the unnamed tributary downstream of the permanent bridge site. The temporary bridge would provide site access for the duration of plant construction (less than 5 years), after which it would be disassembled and replaced by the permanent bridge constructed upstream. The hydraulic design requirement for the temporary bridge would be expected to pass a 2- or 5-year storm. During more severe storm events, Sewell Creek may overflow its banks and overtop the height of the temporary bridge, causing water to flow over the bridge and restricting access to the site during construction. However, the backwater effect would impact undeveloped areas that are immediately upstream of the temporary bridge.

2.4.3 Fuel Supply

The WGC plant would be fueled by beneficiated coal refuse obtained from Anjean, Green Valley, Donegan, Joe Knob and other sites having a high remediation priority (as defined by WVDEP) that become available or are more economical. The characteristics of coal refuse from Anjean and Green Valley are depicted in Table 2.4-1. The characteristics of the Donegan and Joe Knob coal refuse are still being investigated by WGC; however, the proposed use of beneficiation would result in comparable characteristics of processed fuel for the CFB plant.

Table 2.4-1. Characteristics of Anjean and Green Valley Coal Refuse

Parameter	Anjean[1]	Green Valley[2]
Carbon	26.94%	23.31%
Hydrogen	1.62	1.41
Nitrogen	0.68	0.59
Oxygen	3.07	2.66
Sulfur	1.48	0.59
Moisture	5.50	5.50
Ash	60.71	65.94
Total	100.00%	100.00%
Volatile Matter	12.14%	N/A
Fixed Carbon	21.66	N/A
HHV*	4,184 BTU/lb	3,743 BTU/lb

HHV - higher heating value

[1]*Based on weighted averages from 13 borings, 160 data points, no pond fines, 3/8-in x 100m product.*

[2]*Based on weighted averages from 8 borings, 52 data points, 3/8-in x 100m product.*

2.4.3.1 Anjean Mountain

In 1972, a surface mine permit was issued in Anjean, Greenbrier County, to the Leckie Smokeless Coal Company, later bought by Royal Scot Minerals, Inc., which became bankrupt in 2000. Anjean, which is approximately 14 miles (23 kilometers) from the proposed Co-Production Facility, is a 400-acre (160-hectare) abandoned coal mining area that allegedly has the most environmentally costly coal refuse pile in West Virginia, referred to as the Buck Lilly pile or Anjean Mountain. The Buck Lilly pile is a 40-acre (16-hectare) “black mountain” with approximately 4 million tons (3.6 million metric tons) of coal refuse. The West Virginia Department of Environmental Protection (WVDEP) assumed responsibility for the site when it revoked the surface mine permit and has undertaken remediation at Anjean that is supported by the state’s Special Reclamation Fund. WVDEP is currently spending approximately $250,000 per year in water treatment costs to mitigate acid mine drainage generated by the site and to protect adjacent trout streams. Remediation efforts primarily consist of diverting water that runs off or leaches from the coal refuse areas through a series of chemical treatment ponds before discharge to receiving waters.

In June 2003 WGBDC purchased the Anjean property out of bankruptcy in order to free the property for future community use. On March 2, 2004 WGC and WGBDC entered into a Memo of Understanding (MOU) with WVDEP in which WGC would have access to the Anjean site and the coal refuse (Buck Lilly pile) as a fuel source for its proposed Co-Production Facility in return for the use of the proposed facility’s waste ash in reclamation processes at Anjean **(*See Appendix N for the MOU and agreement of use*)**. The MOU includes the following mutual understandings and intentions with respect to WGC’s proposed remediation plans:

- WGC would develop a remediation plan for the Anjean site, secure WVDEP approval for the plan, provide the plan to WVDEP to administer, and serve as a no-cost contractor to implement portions of the plan with WVDEP’s direction and supervision pursuant to a no-cost reclamation contract having one or more phases.
- Pursuant to the reclamation contract, WGC would remove coal refuse from the Anjean site in consecutive phases; provide a performance bond for each phase of the work; not be required to obtain a mining permit as long as the coal refuse does not qualify as “coal” (under ASTM standards); return as much waste ash to the site as WVDEP determines necessary to reclaim the site; and mix the ash with the unused coal refuse to neutralize it and reduce the cost to WVDEP of treating the ponds at the site. By the conclusion of the process, the entire site would be reclaimed in accordance with the initial or modified surface coal mining permit as revoked from Royal Scot Minerals.
- WVDEP believes that the WGC Project may enable the state agency to fulfill its obligations to reclaim the Anjean site more cost-effectively, thus reducing future financial impact on the Special Reclamation Fund; and that the removal of the coal refuse would help minimize environmental effects that would otherwise occur if the pile were left in place.
- WVDEP and WGC agree to explore the feasibility of extending the MOU to other Forfeited Sites and other sites covered by the federal Abandoned Mines Land Program.
- WVDEP and WGC agree to cooperate on the development of specific details for the Anjean site with respect to areas of responsibility for reclamation, but for which WVDEP would retain full and final authority.

WGC, WGBDC, and WVDEP subsequently entered into a Prospective Purchaser and Waste Coal Access Agreement for the Anjean site on August 12, 2004, which reinforced and formalized the MOU. As part of project planning efforts, conceptual reclamation and reuse plans for Anjean are currently being developed.

Although Anjean is currently abandoned, a surface mine permit application was submitted in June 2005 by the Oxford Mining Company to exercise mining rights in high-quality coal locations on the site. These mining activities would precede WGC's proposed activities at Anjean and would not be expected to conflict with WGC plans to reclaim the coal refuse pile areas. The mining would be covered under a special reclamation agreement between the Oxford Mining Company and the WVDEP, and would result in the reclamation of mining-impacted areas not associated with the coal refuse areas. ***Reclamation plans for the coal refuse piles would not be developed until the design phase of the WGC project; therefore, details of these operations are not available for inclusion in the EIS. However, DOE expects that reclamation plans would be developed under the supervision and direction of WVDEP, and that WVDEP would ultimately own and administer these plans with WGC serving as a no-cost contractor. This expectation is based on the MOU between WGC and WVDEP as summarized above.***

2.4.3.2 Green Valley

The Green Valley site is located approximately 12 miles (19 kilometers) from the proposed Co-Production Facility. The majority of the site is subject to an active mining permit held by Green Valley Coal Company (GVCC), a subsidiary of the Massey Coal Company, which owns the site. The site has been used for coal refuse disposal since the 1920s but is not currently being used for this purpose. Much of the site has been reclaimed. A portion of the coal refuse pile is located on a pre-Surface Mining Control and Reclamation Act of 1977 (SMCRA) mining area that is not subject to a permit and is currently maintained by the WVDEP. The pile covers 70 acres (30 hectares) and ranges in depth from approximately 30 to 200 feet (9 to 60 meters). The use and reclamation of the Green Valley coal refuse pile would be subject to the same conditions as stated in the MOU with WVDEP for the Anjean site (see Section 2.4.3.1 above). As part of project planning efforts, conceptual reclamation and reuse plans for Green Valley are currently being developed.

2.4.3.3 Donegan Mine

The Donegan coal refuse site is located approximately 28 miles (45 kilometers) from the proposed Co-Production Facility on CR 39/14 north of Anjean. It is estimated that mining at Donegan began in the late 1940s or early 1950s and the site was mined by several coal companies (WVDEP, 2005). According to WVDEP, the site is fully reclaimed (i.e., graded and vegetated). Reclamation in the 1970s was started by the Island Creek Coal Company (ICCC), which included the construction of a cap and the construction of a diversion ditch that was completed in the 1990s. The site is now owned by Falcon Land Company, Inc. The mining permit was revoked and the bond forfeited in April 2005 due to failure of continuing water treatment and failure to submit required data concerning water quality. Two weeks after this permit was revoked, WVDEP began treating acid mine drainage at the site. WVDEP is responsible for the treatment costs and has actively updated treatment capabilities for the site; however, no cost estimates are currently available. The use and reclamation of the Donegan coal refuse pile would be subject to the same conditions as stated in the MOU with WVDEP for the Anjean site (see Section 2.4.3.1 above).

2.4.3.4 Joe Knob

The Joe Knob coal refuse site is located approximately 16 miles from the proposed Co-Production Facility and is accessed from the same route as the Anjean Buck Lilly pile. The site has been fully reclaimed and is owned by Mead-Westvaco. WVDEP is currently treating water from this site, but cost estimates for this treatment were not readily available. The use and reclamation of the Joe Knob site would be subject to the same conditions as stated in the MOU with WVDEP for the Anjean site (see Section 2.4.3.1 above).

2.4.4 Fuel Processing

2.4.4.1 Beneficiation/Prep Plant

The proposed beneficiation/prep plant for the WGC Project is described in Section 2.3.6. As planning evolved, WGC considered three fuel-processing alternatives for the CFB plant:

- Crushing and sizing of coal refuse at the power plant site (without beneficiation);
- Crushing, sizing, and beneficiation of coal refuse at the coal refuse sites by a third party using semi-mobile equipment; and
- Crushing, sizing, and beneficiation of coal refuse at a planned new coal preparation facility at the Browns Creek Complex near Anjean.

The owners of a planned coal preparation facility at Browns Creek had considered including a complementary process that would provide shared-use by WGC at the new facility. Consent by the third party was based on assumptions that shared-use would cover the incremental capital cost and also result in additional yield from its newly mined coal. However, after running simulation models, the third party determined that shared-use would not be cost-effective as originally assumed, and it opted to remove this option from further consideration.

The other alternative would be to contract a third party to design and construct an innovative “Low Elevation Coal Processing Plant” that would meet WGC processing requirements. A typical coal preparation plant consists of a building measuring 50 to 85 feet (15 to 26 meters) in height that houses or supports in a vertical arrangement the various levels of machinery necessary to process coal by gravity feed. Thus, the cost of the machinery and construction in a typical installation can reach tens of millions of dollars. Additionally, the costs of transportation and labor to disassemble a typical plant are high, making it more cost-efficient to abandon the equipment and structures, rather than to move the plant to the next site.

The proposed innovative prep plant as mentioned in Section 2.3.6 would be designed to reduce the overall height to an approximate 25-feet (8-meter) height envelope. Through the use of underground sumps and optimized subcircuits, the housing structure, along with the requisite engineering, platework, concrete foundation, piping, labor and maintenance expenses, would be greatly reduced. The reduction in housing height would also reduce the number and total length of steel chutes in the building, thereby lowering noise emissions from the plant. Because pumps would be located in the underground sumps, noise pollution also would be minimized. The novel arrangement not only reduces noise impacts and structural costs, but the ease of construction and disassembly means that this type of facility can be relocated close to another coal refuse source when the nearby sources become depleted. These features were important factors in WGC’s decision to use this type of prep plant. The prep plant site would require approximately two to seven acres (one to three hectares) to support plant facilities, truck movements, and storage areas.

The prep plant would employ separation methods, such as froth flotation, to separate out the reject materials. In the coal industry an anionic polyacrilimide flocculent, either in the form of an emulsion (liquid) or a dry solid (powder), is typically used for liquid/solids separation. Coal cleaning plants typically choose emulsion flocculants due to ease of application, because they require less equipment and manpower and are easier to store. Additionally, because of colloidal material such as clays in the coal refuse, a cationic coagulant is required to aid in the liquid/solids separation. To aid in flotation separation, many prep plants also use diesel or kerosene. Sulfuric acid and sodium hydroxide are commonly used to assist in precipitating colloidal material and controlling pH. Ammonia may also be used, but it is less favored due to odor issues. In some instances water runoff is treated with coagulants or flocculants due to high solids.

The types of chemical and rates would be dependent on the coal refuse characteristic. It is expected that industry-standard chemicals would be used during the beneficiation process. It is anticipated that the prep plant would employ general storm water management practices that are typical at cleaning plants (e.g., containment ditches, secondary containment basins and special collection ponds), although details on specific contamination prevention devices are also uncertain at this time. It is expected that bulk chemicals would typically be delivered in chemical “totes” and stored inside a secondary containment barrier. Chemicals would likely be fed into equipment using chemical feed pumps providing delivery in a controlled manner. The material and waste streams would be handled and managed in accordance with federal and state regulations. Anticipated chemicals to be used in the prep plant are listed in Table 2.4-2. WGC is currently investigating the feasibility of marketing the recovered iron pyrite as a product to third parties; however, this action would be dependent on the chemical makeup of the spoils. If this material were not marketable, WGC would dispose of it in a landfill permitted to accept iron pyrite or would otherwise dispose of the material as agreeable by WVDEP in accordance with the remediation of the coal refuse piles.

Beneficiation of the coal refuse near the source piles results in significantly less on-road hauling of materials, lower capital costs for the power plant, and reduced environmental impacts at the power plant site. If crushing and sizing would be conducted at the power plant site, and un-beneficiated coal refuse were used to feed the boiler, all of the coal refuse (above a certain BTU heating value) would need to be trucked from the refuse piles to the power plant site. If beneficiation were conducted at the power plant site, additional space would be required, and additional noise and dust would be generated at the power plant site. Alternatively, if beneficiation were performed near the coal refuse piles, only the beneficiated fuel would be transported to the power plant site. Also, less limestone would be required for the boilers to neutralize the production of sulfur oxide gases. Hence, a smaller power plant and smaller appurtenant facilities would be required, which would result in lower costs and reduced environmental impacts at the power plant site.

Table 2.4-2. Anticipated Prep Plant Chemicals (or Comparable)

Product Name	Manufacturer	Application	Characterization
CAT-FLOC® 83701	Nalco Company	Coagulant	Non-hazardous
CAT-FLOC® 9851 PLUS	Nalco Company	Coagulant	Non-hazardous
NALCO 9850	Nalco Company	Closed circuit coagulant	Non-hazardous
OPTIMER® 83949	Nalco Company	Flocculent	Non-hazardous
OPTIMER® 9806	Nalco Company	Flocculent	Non-hazardous
03DF038	Nalco Company	Flocculent	Hazardous (CAS* 79-06-1)
EN/ACT® 7880	Nalco Company	Clarification aid	Hazardous (CAS 12042-91-0 and 10043-52-4)
NALFLOTE 9843	Nalco Company	Floatation reagent	Hazardous (C4-C18**)
9835	Nalco Company	Floatation reagent	Hazardous (C4-C18)
Sodium Hydroxide, 20%	Generic	pH Control	Hazardous (CAS 1310-73-2)
Sulfuric Acid, 10%	Generic	pH Control	Hazardous (CAS 7664-93-9)

**Chemical Abstract Service number; **OSHA Hazard Communication Rule, 29 CFR 1910.1200, category*

After weighing the feasibility and cost-effectiveness of the fuel-processing alternatives, WGC decided on the beneficiation of coal refuse by a third party using semi-mobile equipment at or near the coal refuse sites. WGC determined that the prep plant design would provide a significant reduction in capital cost with only a minor increase in operations and maintenance costs. Additional savings in limestone expenses would largely offset the increased costs for fuel processing. Furthermore, the volume of truck traffic to and from the power plant site would be reduced greatly by beneficiation at the source piles instead of at the power plant site. Therefore, WGC concluded that the reliability of fuel handling and storage would be greatly enhanced and environmental impacts would be reduced by this alternative.

2.4.4.2 Beneficiation/Prep Plant Siting

As discussed in Section 2.2.3, the initial location of the semi-mobile prep plant would serve the Anjean (Buck Lilly) and Joe Knob coal refuse sites, which would provide beneficiated fuel for the first 4 years of WGC operation. Additional permitted locations would be established near the Donegan and

Green Valley sites for the subsequent 16 years of operation (approximately 11 years at Donegan and 5 years at Green Valley).

WGC has identified six candidate beneficiation plant sites to serve the four coal refuse sites (see Section 2.2-3 and Figure 2.2-15): three for Anjean and Joe Knob (AN1, AN2, and AN3), two for Donegan (DN1 and DN2), and one for Green Valley (GV). Important siting criteria for the prep plant include, but are not limited to, the following: property availability, acreage, accessibility for on- and off-road vehicles, proximity to coal refuse sources, proximity to sensitive receptors, type of land cover, flooding potential, and proximity to supply resources (e.g., groundwater and power). Various permits may be required, such as for storm water discharge. In the event that WGC identifies additional candidate sites for a prep plant, the same siting criteria would apply.

Preliminary site visits were conducted at all sites; however, access was restricted for DN2 (Beech Knob), so observations were limited to views from the adjoining road (CR 1) and to aerial photographs made during 1990. Table 2.4-3 summarizes general site characteristics. The following discussion provides a synopsis of each site's features based on field observations supplemented by interpretations of aerial photography and USGS topographic maps.

Table 2.4-3. Site Characteristics of Potential Prep Plant Locations

Site	Coal refuse Source	Approximate Acreage*	Distance to Coal refuse**	Distance to power plant site**
AN1	Anjean/Joe Knob	10 acres	4 miles (to Buck Lilly), 4.5 miles (to Joe Knob)	14 miles
AN2	Anjean/Joe Knob	3 acres	4 miles (to Buck Lilly), 6 miles (to Joe Knob)	14 miles
AN3	Anjean/Joe Knob	2 acres	<0.1 mile to Anjean, 2 miles to Joe Knob	18 miles
DN1	Donegan	7 acres	0.1 mile	28 miles
DN2	Donegan	8 acres	7 miles	21 miles
GV	Green Valley	8 acres	< 0.1 mile	13 miles

**To convert acres to hectares, multiply by 0.4047.*

***To convert miles to kilometers, multiply by 1.6093.*

AN1

AN1 is located just inside the access point to the Anjean mining area, east of CR 1 and south of the Big Clear Creek and South Fork intersection. A bridge crossing (over Big Clear Creek), which would need to be upgraded for the haul trucks, provides access to the site. Most of the site is disturbed and generally slopes to the north and west. The land is owned by Mead-Westvaco and there are treatment/settling ponds that manage some of Anjean's runoff. According to WGC, WVDEP would be excavating and filling these ponds in the future and the area could then potentially become available for a new prep plant. The land cover is mostly grass with some shrubs and young deciduous trees. The advantages of AN1 would be: proximity to the Anjean and Joe Knob coal refuse sources, availability of sufficient site space, proximity to CR 1, limited requirements for clearing, and the absence of sensitive receptors. A disadvantage would be potential land use conflicts associated with WVDEP activities.

AN2

AN2 is located west of CR 1, directly across the road from the access point to the Anjean site. The land is disturbed and includes an abandoned rail line and a parallel gravel road. Currently, Mead-Westvaco owns the site, which is bounded by CR 1 to the east and a small hill to the west. Based on aerial photos, the immediate area is approximately two to three acres (1 to 1.2 hectares) in size and is rectangular in shape. To provide more efficient space for the prep plant activities and truck movements, additional space may be needed to the north and south, and/or the hillside could be partially excavated. Site vegetation is mostly grass, and there is rip-rap on both sides of the gravel road. The site drains into Big Clear Creek, just east of the site. The advantages of AN2 include: its proximity to Anjean/Joe Knob coal refuse sources, its proximity to CR 1, and the absence of sensitive receptors. Disadvantages include: limited space, the likely need for excavation on the hill, the need for off-road vehicles to cross CR 1, and the potential need to remove the existing rail line.

AN3

AN3 is located at the foot of the Buck Lilly pile (eastern border) and can be accessed from the existing haul road at the mining site. This haul road is also the same road used to access Joe Knob. The site is owned by WGBDC, and WVDEP has some of its equipment scattered across the site. The immediate site is approximately two acres (one hectare) in size; however, prep plant activities would mostly likely spread to the north and south. The area is relatively flat and is bounded by Buck Lilly to the west and the hillside to the east. Runoff from the site most likely drains to Buck Lilly branch and subsequently into Little Clear Creek. The ground cover is mostly gravel with some grass and trees near the edges of the site. Advantages of AN3 include: its location on the existing haul road that serves both Anjean and Joe Knob, the absence of sensitive receptors, limited requirements for clearing vegetation, and the presence of level topography. Disadvantages include: limited space that may constrain truck movements (unless trucks can move in a circular pattern around Buck Lilly), the need for on-road trucks to travel up the steep unpaved haul road to the top of the mountain, and the prevalence of severe weather conditions on top of the mountain.

DN1

DN1 is located on CR 39/14, slightly northwest of the entrance into the Donegan site, which is located in a very remote area. There is an abandoned building on site, which was used for mining activities in the past, and WVDEP settling ponds are situated to the west. Most of the site is on disturbed land and is fairly level with some gentle sloping to the northwest. The surrounding land cover is mostly grasses, shrubs, and some deciduous trees. The majority of the site’s runoff eventually discharges into Laurel Creek. Currently, the land is being held by the state for tax recovery. Advantages of DN1 include: the availability of sufficient space, proximity to the coal refuse source, and the absence of sensitive receptors. DN1 is ideally situated to serve the Donegan fuel source and, at this time, there are no observable disadvantages of DN1.

DN2

DN2 is located on CR 1, approximately 10 miles (16 kilometers) north of Anjean, in an area known as Beech Knob. The site is privately owned, and it is unknown at this time whether the property would be readily available for WGC’s use. However, because of the sufficient amount of disturbed land located at this site and its close proximity to Donegan, WGC is currently investigating the site’s availability. Site observation was limited to the view along CR 1; however, upon examining aerial photography, the land appears to be an open field that was most likely used for agriculture in the past. Based on USGS maps, the land appears to be relatively flat and generally slopes to the north.

An existing haul road that was used in the past for mining activities and hauling coal could provide a route for off-road vehicles between Beech Knob and Donegan (approximately 7 miles [11 kilometers] away). With some minor upgrades to this haul road, off-road vehicles could transport coal refuse to the Beech Knob site. Advantages of DN2 include: the availability of sufficient space on previously disturbed and level ground. Disadvantages include: the site’s proximity to scattered residential properties that exist along CR 1 and nearby, the need for off-road trucks to travel a long distance along a haul road before reaching DN2, the uncertain availability of a water source (due to the location on a ridge), and the uncertain availability of 3-phase power.

GV

The GV prep plant site would be located along the southern margin of the Green Valley coal refuse pile on land currently owned by Massey Coal Company. The site would be situated to make use of existing treatment ponds and to provide access from WV 20. The site is heavily vegetated with grasses, shrubs, and young deciduous trees. Also, Colt Branch, which was relocated and diverted in the past to avoid the coal refuse pile, traverses part of the site. The site is bounded by Hominy Creek to the south and the coal refuse pile to the north. Advantages of GV would include: its proximity to the Green Valley coal refuse source (off-road trucks would not need to cross public roads), its proximity to WV 20, and the absence of sensitive receptors. Disadvantages include: the existence of overlying coal refuse that may need to be excavated and stored prior to construction and the need to investigate depth to the groundwater table.

2.4.5 Limestone Supply

The selection of a limestone source to support the requirements of the boiler for the proposed power plant is largely dependent on the characteristics of the material, primarily the calcium carbonate content and reactivity of the limestone. The calcium carbonate requirement for the boiler limestone is a matter of economic feasibility that maximizes the amount of usable calcium per dollar of expended cost (i.e., transport and handling costs). WGC has determined that 70 percent approximates the cutoff point for the lowest economic calcium carbonate content. The kiln requires a limestone of higher quality with greater than 90 percent calcium carbonate.

Commercial sources of limestone are available from several local quarries as identified in Section 2.2.3. The most likely source of limestone for the boiler would be the Boxley Quarry in Alta near Lewisburg, WV. The Boxley quarry is a permitted facility that is owned by the Boxley Material Company (BMC). The quarry is currently operating and has sufficient reserves to supply the WGC Project and its existing customer base. WGC has identified Mill Point Quarry as a primary source for the kiln limestone. Mill Point is also owned by BMC and is located approximately 60 miles (97 kilometers) from Rainelle along US 219. In a letter addressed to WGC, BMC has provided a statement of confidence that the required limestone for the proposed Co-Production Facility can be supplied by the quarries in Alta and Mill Point for the plant’s projected 20-year operation. BMC states that the calcium carbonate levels meet or exceed the requirements of 70 percent for boiler operations and 90 percent for kiln operations.

Alternate sources of calcium carbonate or calcium oxide for the kiln operations are also being considered, such as waste kiln dust from other facilities. Materials from alternate sources would likely be barged to Charleston and trucked to the plant site. However, due to the high calcium oxide content of such sources, lesser quantities and fewer truckloads would be needed in comparison to limestone.

The options that were considered by WGC for sources of limestone or other calcium carbonate material are listed below.

- Option A – Truck limestone from the Boxley Quarry in Alta (for the boiler) and Mill Point (for the kiln), with trucking the responsibility of the quarry or other third party.
- Option B – Truck limestone from Greystone quarry or other permitted quarry in the Lewisburg area (for the boiler) and Mill Point (for the kiln), with trucking the responsibility of the quarry or other third party.
- Option C – Truck limestone from an acceptable quarry in the Lewisburg area (for the boiler), with trucking the responsibility of the quarry or other third party. Barge/truck material with high calcium oxide content for the kiln (e.g., limestone fines with 96 to 98 percent calcium carbonate content currently being disposed as waste by a Kentucky facility). Material would be barged into Charleston and trucked along US 60 under contract to the site.

Because of limestone quality and shorter travel distances, WGC identified Option A as the preferred means of limestone supply for the project.

2.4.6 Water Supply

Water supply requirements for the facility range from approximately 900 to 1,200 gallons per minute (1.3 to 1.7 million gallons per day or 4.9 to 6.4 million liters per day) depending upon seasonal fluctuations (with peak demand in the summer months). WGC expects to use all of the treated wastewater effluent from Rainelle Sewage Treatment Plant (RSTP) for the project, supplemented by withdrawals from the Meadow River and/or groundwater sources. Based on the amount of RSTP effluent generated on a seasonal basis, an additional 300 to 800 gallons per minute (0.45 to 1.15 million gallons per day or 1.70 to 4.35 million liters per day) would be required from the supplemental sources (see Figure 2.4-5). Key assumptions (Parsons, 2005; B&A 2006) used in estimating plant water demand as illustrated in Figure 2.4-5 include:

- Circulation water flow rate of 55,000 gallons per minute (210,000 liters per minute).
- Cooling tower evaporation rate per manufacturer's curves.
- Cooling tower blowdown is set by 6 cycles of concentration. Cooling tower blowdown is liquid discharge from the cooling tower that is high in non-hazardous dissolved solids and is re-used within the plant for makeup to the flash dryer absorber, dust suppression, etc.
- In addition to the water required for cooling tower makeup (and blowdown, which is recycled within the plant), an additional makeup stream of about 100,000 gallons per day (380,000 liters per day) is required for the plant steam cycle makeup treatment system and potable/sanitary use. This rate is relatively constant throughout the year. Cooling tower blowdown is not used for this purpose as it is much too high in dissolved solids, and would impose a large and unnecessary burden on the cycle makeup treatment system.
- 100 percent of the Rainelle wastewater treatment plant effluent would be diverted for plant makeup water with a variable demand on other sources to make up the balance.

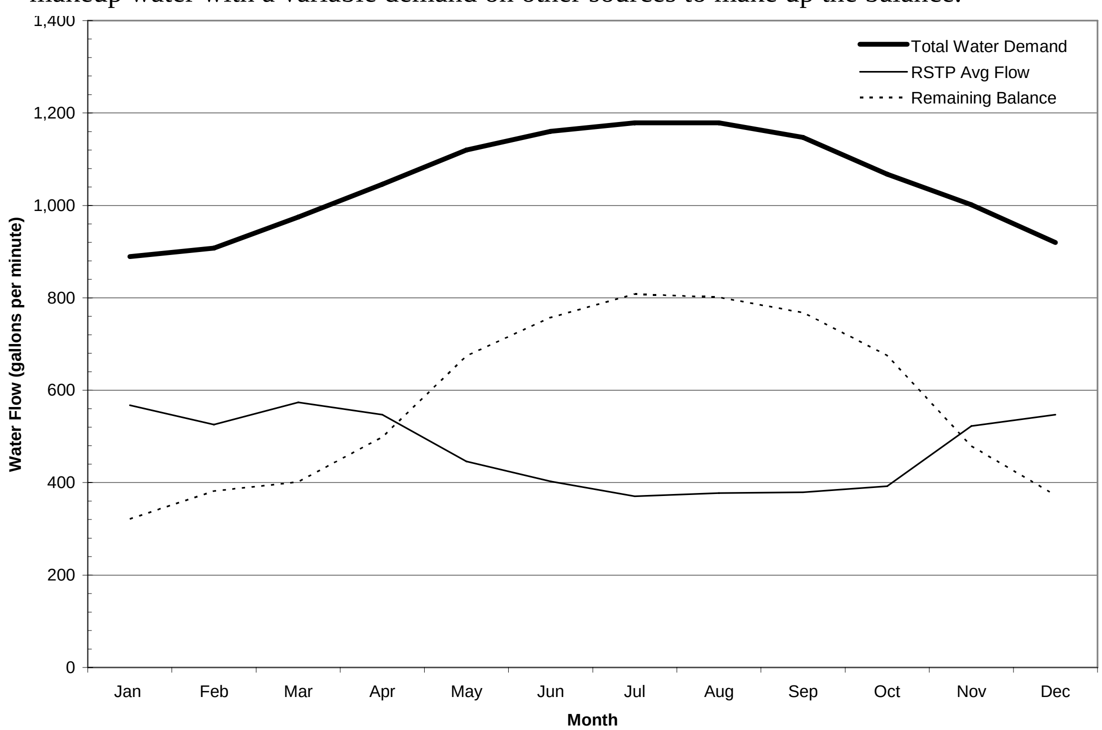

Figure 2.4-5. Water Requirements and Deficiencies

Supplemental water withdrawals from the Meadow River would be sustainable provided that the river flow would not be reduced below 60 percent of the seasonally or annually adjusted average flow rate (i.e.,

based on the Tennant Method, the river flow rate above which adverse water quality and aquatic habitat impacts would not be expected), on any given day. Therefore, the river could meet nearly all of the supplemental water demand by the WGC plant during the winter and spring months. However, during the dry months in summer and early autumn, and during prolonged periods of low flow, the river could not be depended upon to meet the full supplemental water demand by the plant. Withdrawal from the Meadow River would occur via a permanent or temporary structure located approximately 500 feet (152 meters) upstream of the RSTP near the confluence of Sewell Creek (see Figure 2.2-3). The river water would be pumped to a holding tank at the RSTP, where it would be mixed with RSTP effluent and conveyed to the WGC plant in the same water supply pipeline.

WGC could also satisfy part of the supplemental water demand using groundwater from two wells in Rainelle: Production Well Number 1 (PW-1) and the "Snake Island" well (PW-3). Groundwater would be conveyed to the same holding tank at the RSTP as for river water, where it would be mixed with RSTP effluent and conveyed to the WGC plant in the same water supply pipeline. ***An ongoing groundwater study referenced in the Draft EIS has now been completed and reviewed by DOE and has been added to the Final EIS (see Appendix D2). This study provides more insight to facilitate WGC's water use decisions and confirms assumptions and impacts as evaluated in the Draft EIS. Results from this study are discussed in Section 4.6.3.4 of this volume and in Section 4.4.2 of Volume 3.***

Because there is some uncertainty regarding whether sufficient water would be available from either the Meadow River or groundwater sources under extended low recharge conditions, WGC has considered two options for supplemental process water supply for the power plant. Both options provide measures to ensure that the power plant maintains an adequate water supply without compromising the local aquifer in Rainelle or reducing flow in the Meadow River below a state recommended threshold.

- Option A – WGC would withdraw groundwater from PW-1 and PW-3 (and other potential wells) as the secondary source of water supply to supplement the use of up to 100 percent of the RSTP effluent. As a tertiary source of water supply, WGC would take water from Meadow River using a temporary withdrawal structure to be located near the RSTP.
- Option B – As the secondary source of water supply to supplement the use of up to 100 percent of the RSTP effluent, WGC would take water from the Meadow River using a permanent withdrawal structure to be located approximately 500 feet upstream of the RSTP. During periods when withdrawals would cause the flow in the Meadow River to decline below 60% of ***the average annual or seasonal*** flow (i.e., ***based on the Tennant Method,*** the river flow rate above which adverse water quality and aquatic habitat impacts would not be expected), WGC would withdraw groundwater from PW-1, PW-3, and other potential wells as a tertiary source of process water supply. ***Since the Draft EIS was published, river withdrawal guidelines have been developed by the West Virginia Division of Natural Resources (WVDNR), including recommended flows to be maintained (see below for flow values).***

WVDNR estimated flows in the Meadow River using the Watershed Characterization and Modeling System and determined that the average annual flow for the proposed withdrawal site is approximately 296 cubic feet per second. WVDNR also reviewed aquatic sampling results immediately downstream from the proposed location of the intake structure on the Meadow River. Thus, based on the Tennant Method, WVDNR has prescribed the following guidelines which would be followed by WGC:

- ***A flow of 178 cubic feet per second must always be maintained in the Meadow River during the months of April – September (Spring/Summer);***
- ***A flow of 118 cubic feet per second must always be maintained in the Meadow River during the months of October – March (Fall/Winter);***
- ***Approximately 2.7 cubic feet per second is the maximum rate at which WGC would be allowed to withdraw water from the river; and***

- ***A flow monitoring gage via a calibrated staff (i.e., a rated staff that relates water levels to corresponding streamflows at a given location) must be implemented to alert operators or inspectors when the flows are at or approaching the thresholds.***

Details of WVDNR's stream studies and modeling, potential impacts, and specific monitoring requirements will be reviewed and made available by WVDEP during the 401 Certification permitting process. Potential impacts to surface water and groundwater resources, based on the state guidelines, are discussed in Sections 4.4.3.3 and 4.6.3.4 of this volume, respectively. General Responses 4.4.1 and 4.4.2 of Volume 3 also discuss impacts to the Meadow River and the local aquifer, respectively, to address the concerns expressed in the public comments.

Because ***Option A may have a greater influence on*** long-term pumping effects on the local aquifer, WGC ***and DOE have*** identified Option B as its preferred means of process water supply for the project.

2.4.7 Material Handling and Transportation

Initially, WGC considered the following alternatives for transportation of fuel supplies:

- Option A – Truck transport.
- Option B – Rail transport.

For reasons described in greater detail below, WGC concluded that rail transport would not be economically feasible ***and practicable from an operational standpoint***. Truck transport, Option A, has been evaluated as the only feasible means of transportation for fuel supplies in this EIS.

Heavy trucks would be used to transport materials to and from the plant site. WGC initially considered rail transport of coal refuse and discussed this prospect with local officials and the public. The cost associated with infrastructure upgrades (including rail spurs at the site and coal refuse piles, upgrade requirements for disused sections of the rail line, and rail loading/unloading facilities) was a key consideration when evaluating the rail option. The ability of the site layout to accommodate a rail line was also a key factor, as were the material handling requirements at both the power plant and coal refuse sites.

WGC presented a comparison between the use of heavy trucks and rail transportation for the project to the local community. Considerations that were taken into account included fuel requirements, travel routes, material and transport equipment costs at the coal refuse and limestone sites and at the proposed power plant, transport scheduling and employment numbers. ***Because the fuel supply would come from multiple sources, having to provide rail facilities at each coal refuse pile would complicate the use of rail as an option.*** Based on the need for substantial rail upgrades, the rail alignment constraints at the plant site, and the cost implications related to excessive material handling requirements, rail transport was not considered economically feasible or practical from an operational standpoint and, therefore, Option B was eliminated from further consideration.

As stated in Section 2.4.4.2, one of the important factors of siting a prep plant location would be enabling access by off-road vehicles for the coal refuse transportation to the prep plants. The processed fuel would be delivered to the power plant site from the prep plant using 40-ton dump trailers hauled by 550 HP (or equivalent) on-road tractors. Limestone and other materials delivered in large quantities would be transported in 20-ton dump trailers hauled by 550 HP (or equivalent) tractors. The quantities of raw materials and associated numbers of truck deliveries for the project presented in Table 2.4-4 represent upper bound estimates, which assume worst case material demand and with deliveries restricted to between 8 a.m. and 5 p.m., Monday through Friday. The 40-ton trailers returning to the coal refuse sites would haul excess waste ash to be used in reclaiming the sites. Figure 2.4-6 illustrates the anticipated transportation routes for coal refuse, processed fuel, and limestone. With the exception of coal refuse, processed fuel, and ash, it is expected that suppliers or commercial trucking companies would provide all trucking operations. Commercial rail delivery of some process materials (e.g., alumina) to existing spurs may be considered; however, these deliveries would take place without an increase in rail frequency through Rainelle ***as delivery of these materials would be in relatively small quantities and transported on existing scheduled rail deliveries***.

Table 2.4-4. Worst-Case Trucking Requirements for Hauling Beneficiated Coal Refuse and Materials to Plant Site during Plant Operation

Material	Trailer Size (tons)+	Tons/ Week+	Hours of Operation (hours/shift)	Avg Truck Roundtrips* During Operations
Power Plant				
Processed Coal and Ash Return	40	12,600	8 a.m.-5 p.m. (8hr), Mon-Fri	8 per hour
Limestone	20	689	8 a.m.-5 p.m. (8hr), Mon-Fri	1 per hour
Kiln/Cement Production Facility**				
Raw Material Delivery	20	163	8a.m.-5 p.m. (8hr), Mon-Fri	2 per shift
Alumina source	20	95	8 a.m.-5 p.m. (8hr), Mon-Fri	1 per shift
Gypsum source	20	354	8 a.m.-5 p.m. (8hr), Mon-Fri	4 per shift
Kiln Fuel	20	117	8 a.m.-5 p.m. (8hr), Mon-Fri	1 per shift
Limestone (high-quality)	20	980	8 a.m.-5 p.m. (8hr), Mon-Fri	10 per shift
Cement	20	700	8 a.m.-5 p.m. (8hr), Mon-Fri	7 per shift

Note: Material requirements represent worst-case scenarios. (Sources: WGC a, b, c)

**1 roundtrip = 2 trips (in and out)*

*** Associated kiln/cement production trucks were estimated and analyzed to capture worst-case scenarios associated with potential cement related deliveries*

+To convert tons to metric tons, multiply tons value by 0.9072.

Figure 2.4-6.
Expected Material Transportation Routes (30-mile radius)

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WGC is considering the following options for coal refuse hauling:

- WGC would procure and operate its own fleet of trucks.
- WGC would contract with a municipally-owned trucking company. Under this option, one or more of the municipalities owning WGC would form its own trucking company and be responsible for siting, construction, and operation of a truck facility, as well as the procurement and maintenance of a truck fleet.
- WGC would contract with a privately owned trucking company (e.g., a regional trucking company would locate facilities in the area and provide all trucking and hauling).

The most likely location for a truck storage and maintenance yard is a site located in Charmco (see Figures 2.4-7 and 2.4-8). The site is centrally located to the project (i.e., between the power plant site and the coal refuse sites) and is currently abandoned and available for use. WGC is currently negotiating with a private developer for the purchase or lease of this property. The area is located on the north side of WV 20 and US 60 and is approximately 9 acres (4 hectares) in size. It is located approximately 3 miles (5 kilometers) northeast of Rainelle and was formerly a drive-in movie theater. The majority of the site has been disturbed and cleared of vegetation, with the exception of areas along the perimeter of the property, and it consists of bare soil and gravel. The site contains a small, one-story masonry structure located near the center of the property.

Figure 2.4-7. Charmco Yard Site

2.4.8 Power Transmission Corridor

Initial plans for the WGC Project included the extension of power transmission lines from the plant approximately 4,000 feet (1,220 meters) to the northwest and connecting to the existing AEP transmission lines. However, WGC subsequently determined that the AEP lines lacked adequate capacity to accommodate the plant output. Due to the infrastructure upgrade requirements and feasibility of using the AEP corridor, WGC considered the following options for exporting the generated electricity to the national grid:

- Option A –Widen existing ROW to Grassy Falls Substation to accommodate new poles and lines;
- Option B – Upgrade existing AEP poles to carry WGC lines north to Grassy Falls Substation and south to Layland Substation;
- Option C – Construct new transmission corridor to Grassy Falls Substation.

Conceptual routes for transmission corridors to Grassy Falls are illustrated in Figure 2.4-9. The existing route would be used under Options A or B as described above, whereas a newly proposed corridor would be considered under Option C. Options A and B would would affect more landowners. Option C would have least impact on private landowners as it traverses large tracts of land owned by timber companies and would be more cost effective than the other options. Therefore, WGC's preference for transmitting electricity from the proposed facility is Option C. The specific alignment for Option C would ultimately be dependent on securing options for a ROW and other factors that may affect siting (e.g., environmental constraints). Representative views of the existing AEP corridor between Rainelle and Grassy Falls are provided in Figure 2.4-10.

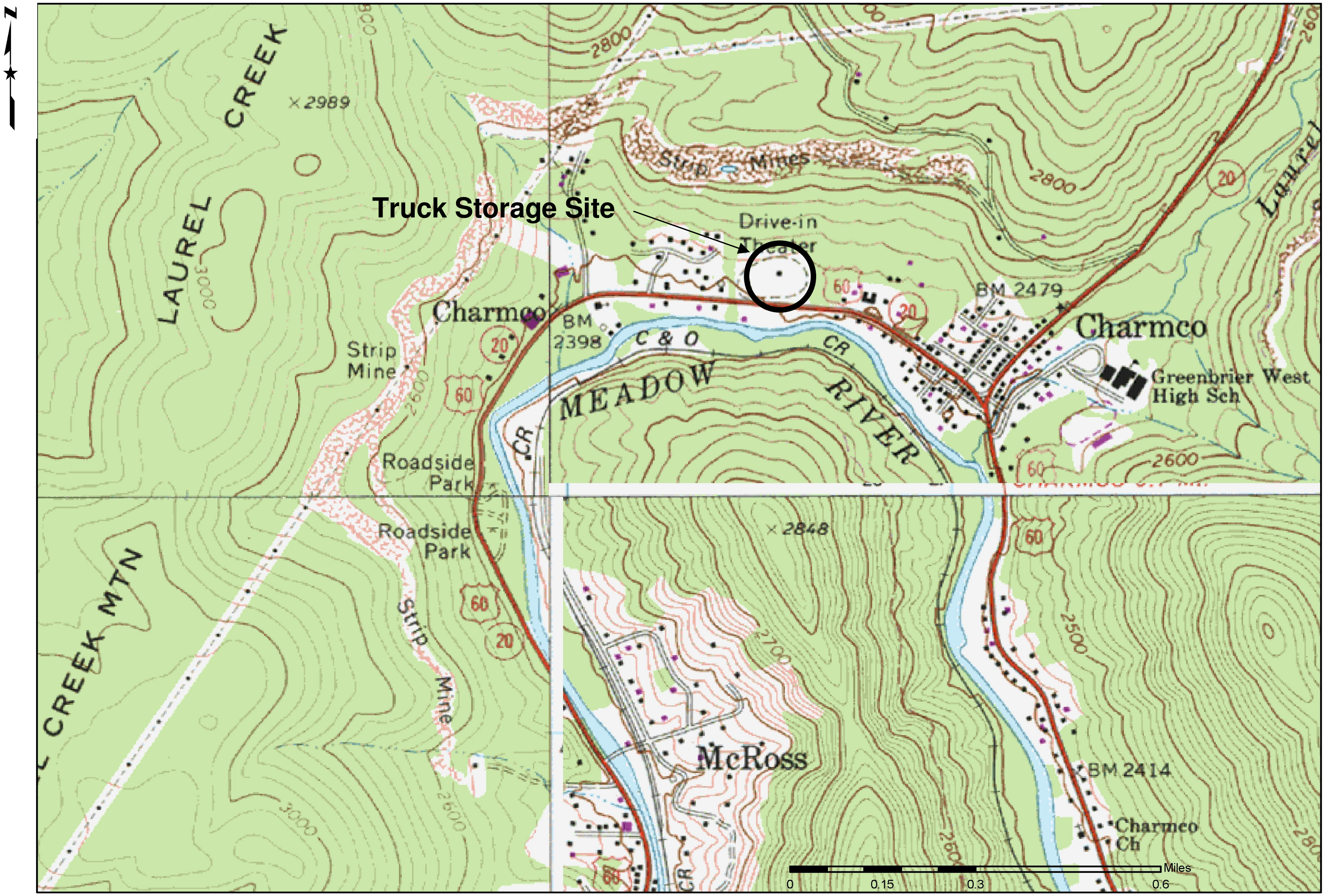

Figure 2.4-8.
Potential Truck Storage Site (Charmco)
Map Source: USGS topo (1:24,000) Quinwood (1981)

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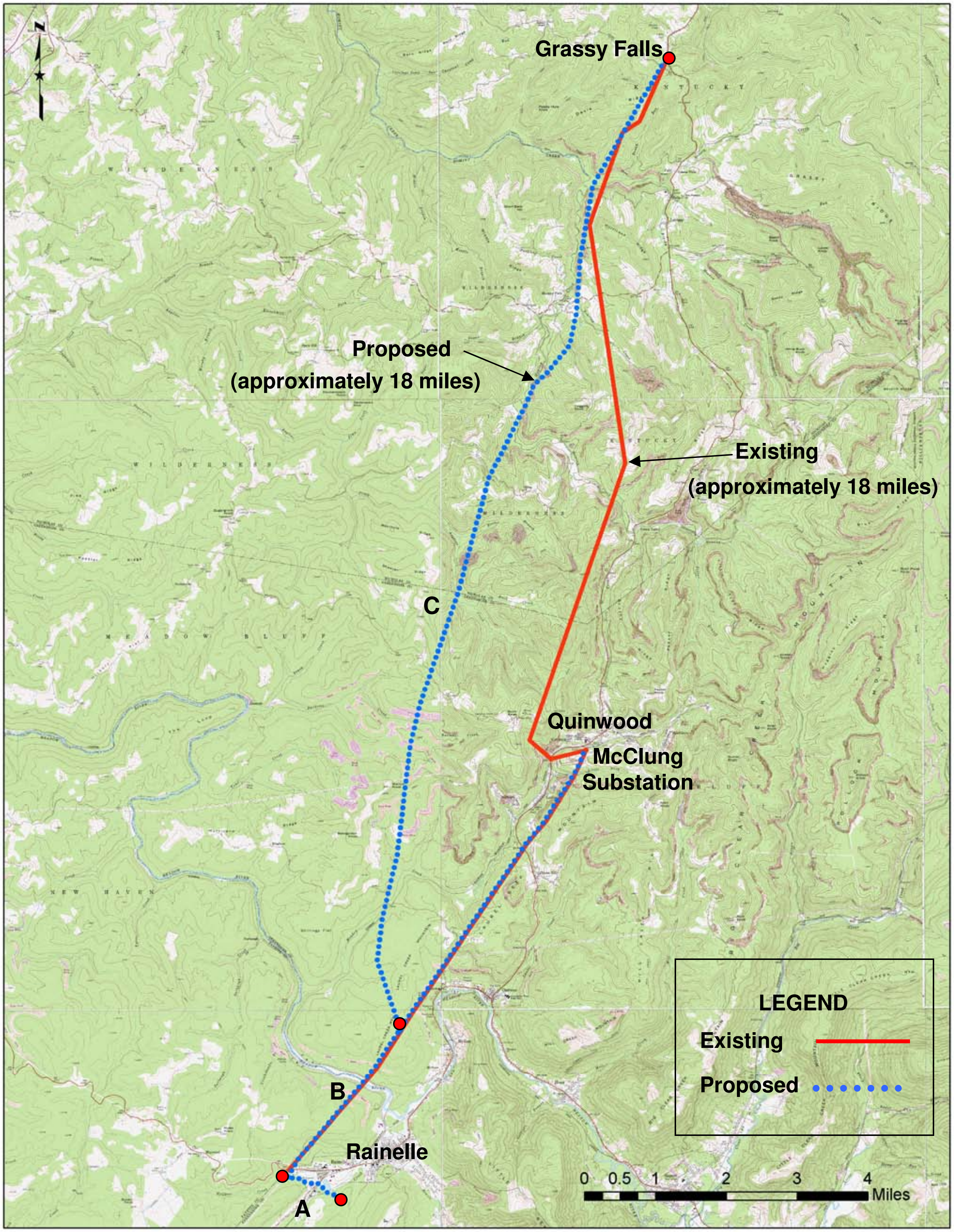

Figure 2.4-9.
Transmission Corridor Options

Sources: USGS topo (1:24,000) - Rainelle (1976), Rupert (1981), Quinwood (1981)

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AEP Corridor (Rainelle to McClung)


AEP Corridor
(McLung to Grassy Falls)


Grassy Falls Substation

Figure 2.4-10. Representative Views of Existing AEP Corridor

Under Option C, WGC would procure a ROW (100 feet [30 meters] wide), clear the corridor, and construct and maintain the power transmission infrastructure. The proposed power plant would be connected to the Pennsylvania Jersey Maryland (PJM) Regional Transmission Organization (RTO) by connection to the Grassy Falls 138kV substation (owned by Allegheny Power) via a new 138kV line. WGC intends to contract for the design and construction of the transmission line, and anticipates that the contractor will use a metal pole configuration.

2.4.9 Construction and Operation Plans

2.4.9.1 Co-Production Facility Construction

Construction of facilities for the power plant and kiln would occur during an approximate 29-month period, most likely beginning during 2007, followed by several months of startup and testing. Work would commence in the first 3 months with the preparation of staging and laydown areas for the storage of equipment and supplies, as well as the construction of a temporary access road from John Raine Drive to the north end of the proposed plant site, including the installation of a temporary bridge across Sewell Creek (see Figure 2.4-11). Grading and excavation for the main plant and kiln site would follow in approximately the fourth and sixth months, along with construction of foundations for the boiler, turbine, cooling tower, and kiln in the sixth through eleventh months. Erection of the boiler, turbine, and kiln structures would proceed from the eighth through 29th months. Water supply and treatment facilities would be constructed from the ninth through 17th months, and the cooling tower would be erected from the 17th through 21st months. Finally, material-handling facilities would be constructed between the 18th and 29th months.

The general contractor selected by WGC would have ultimate responsibility for the construction of the facility. The general contractor would utilize local and regional craft labor under its own supervision complemented by specialty subcontractors as appropriate. The anticipated hours of construction would be from 7 a.m. to 6 p.m., Monday through Friday. As illustrated in Figure 2.4-12, the manpower requirements during construction would range from a low of three persons in the first month to a peak of more than 270 by the 20th month, then tapering to eight persons in the final month of testing.

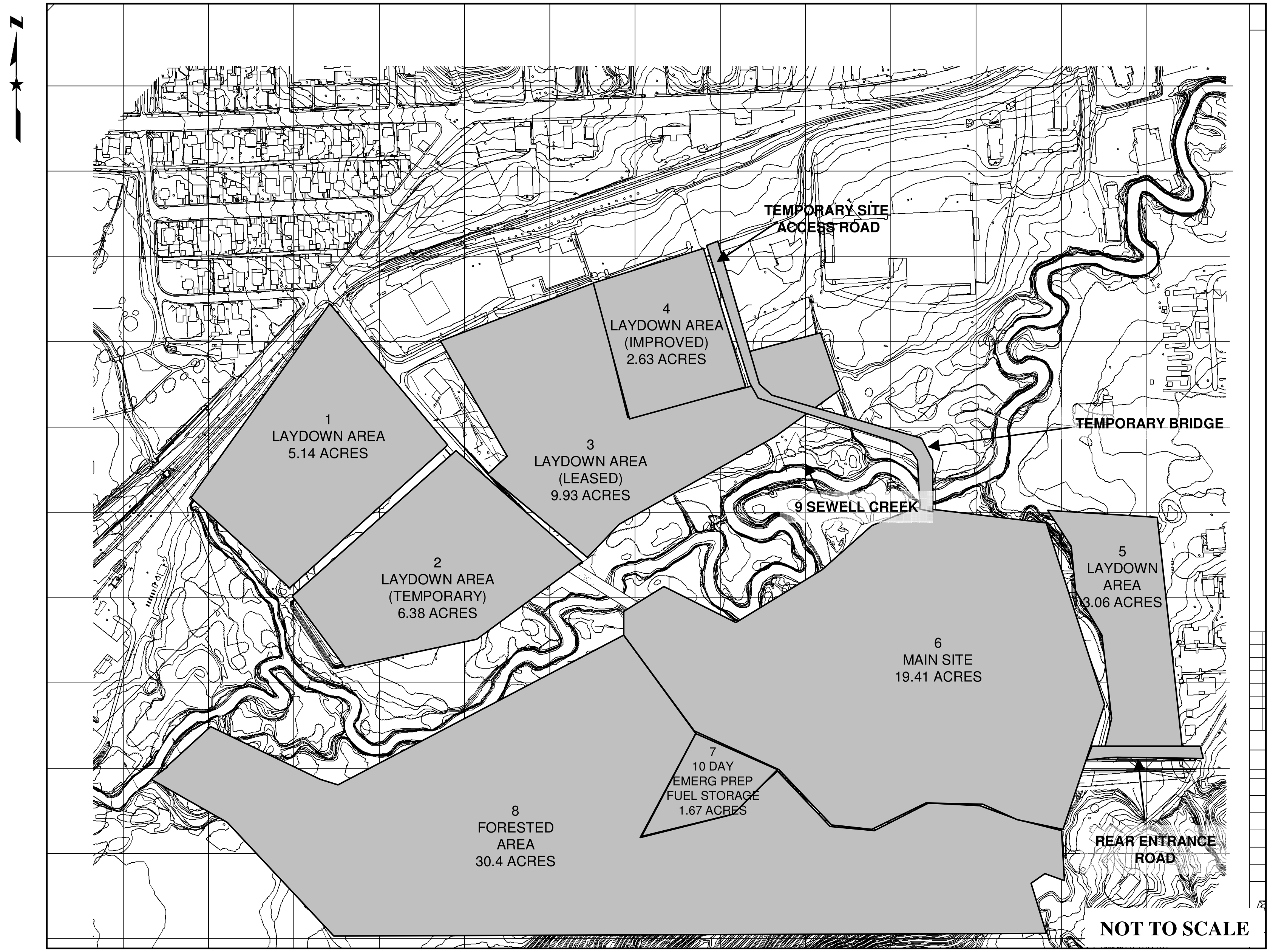

Figure 2.4-11.
Plant Construction and Laydown Areas

Sources: Parsons E&C, 2005

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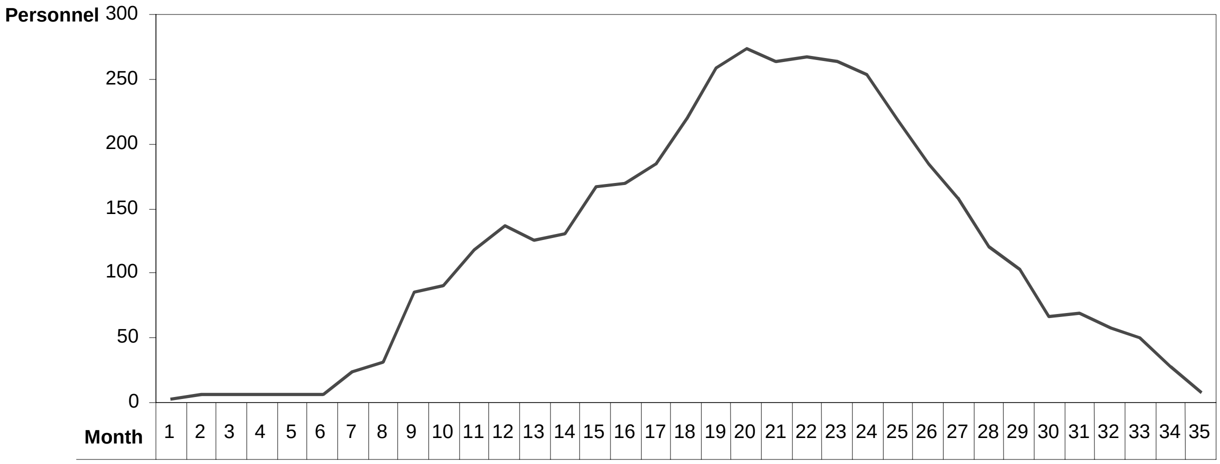

Figure 2.4-12 Manpower Requirements during Construction and Testing

2.4.9.2 Prep Plant Facility Construction

The general method of constructing a prep plant comprises of a) selection of a site; b) excavating sumps, installing concrete liners and building a foundation, and other civil works; c) construction of the plant frame and sheathing on top of the foundation; and d) installing the plant equipment.

The foundation and structural support work would be completed in advance of a move between sites enabling a transition in less than 60 days. The overall foundation footprint would be approximately 100 ft by 150 ft (30 meters by 50 meters). A prepared "ready to burn" fuel reserve sufficient for uncertainty in prep plant availability (including relocation outages) would be established at each prep plant site. The modular prep plant design would enable transport of equipment components by standard flat bed trailers with partial disassembly, loading, unloading, and reassembly facilitated by a small mobile crane.

2.4.9.3 Co-Production Facility Operation

The following paragraphs describe the principal operations at the WGC facilities.

Limestone Preparation Facilities

CFB limestone delivered by the 20-ton dump trailers would be sized and dried in a grinder/screen/dryer process to meet the limestone sizing specifications in the limestone preparation facilities. The prepared limestone would then be transported by a conveyor to the limestone day bin. Kiln limestone would be screened at the quarry and delivered directly to the kiln facility. The processing facilities (grinder/screen/dryer) would be capable of processing up to 35 tons (32 metric tons) of limestone per hour. Although two limestone crushers would be provided, generally only one would be in use at any time.

Boiler Operations

Coal and limestone from the day silos and storage pile would be burned in a CFB reactor located in the boiler building to create heat for the steam turbine generator. Residual ash would be removed, and some of it would be used in the rotary kiln to provide raw material for cement production. An induced draft fan would be connected to the boiler's stack vent to help exhaust gases from combustion. Two forced draft fans would operate to ensure sufficient air supply for the coal combustion in the boiler building.

Steam Turbine Generator (STG) Operations

High-pressure steam would turn the blades of the turbine to create electric energy. At the end of the turbine, the steam would enter a condenser to recapture water and to ensure minimum back-pressure against the turbine.

Exhaust Stack

The majority of the potential emissions from the proposed Co-Production Facility would be generated from the CFB combustor and kiln, which would be emitted through the exhaust stack. The stack would be constructed to a height of approximately 300 feet (90 meters).

Cooling Tower

A cooling tower with four cells would be constructed (tower dimensions comprise approximately 200 feet [60 meters] in length, 50 feet [15 meters] in width, and 62 feet [19 meters] in height). The purpose of the cooling tower is to remove heat from the circulating cooling water system, the principal duty of which is to condense the steam exiting the low-pressure end of the steam turbine and thereby reduce the back-pressure against the steam turbine. The water condensed on the tubes of the condenser will be collected in a sump and recycled to the boiler feedwater system. The circulating cooling water is actually cooled by evaporation in the cooling towers, and this process forms the main “water loss” (and solids accumulation), which requires cooling tower blowdown.

Kiln Operations

Approximately 20 tons (18 metric tons) per hour of high-quality coal fines from the prep plant would be used as fuel for the kiln. Raw meal would be fed into a long, dry kiln where the limestone would be decomposed and the various mineral components chemically combined to form the desired new compounds, in a melted slag called “clinker.” The hot clinker formed in the kiln would pass into a grate-type, air-swept cooler. The air would cool the clinker from approximately 2,300° F to 250° F (1,260° C to 120° C). The cooled clinker would be conveyed to a storage bin, then conveyed to an air-swept ball mill for grinding. The grinding mill product would be stored for bulk delivery to cement users.

Materials Handling

Several considerations were given to the manner in which the power plant facility would manage fuel delivery and handling. Boiler feed specifications, process economics, and site spatial constraints related to available coal storage areas largely influenced the characteristics of the selected material handling system. One of the greatest challenges for handling of coal refuse is the need to reduce moisture content to a workable level. WGC elected to contract with an off-site third party contractor to beneficiate the raw coal refuse to create a ready-to-burn fuel. This option provided the greatest flexibility to WGC while reducing transportation requirements and costs.

Materials handling for the power plant would occur on the southern and western portions of the site, which are the most distant from nearby residences. Delivery trucks with beneficiated fuel, coal fines (for kiln use), or limestone would proceed to the two-day fuel storage pile, the 3.5-day limestone storage pile, or the kiln facility, as appropriate. Coal trucks carrying CFB fuel and kiln fines would be on site for approximately 10 minutes each and limestone trucks for approximately 5 minutes each. Truck deliveries would occur as described in Section 2.4.6, and the subsequent transfer of materials to the coal silos and limestone preparation building would occur 24 hours per day.

Wastewater Management

Process water from plant operations would be collected and treated by the plant’s proposed wastewater treatment system for recycling as needed for plant operations. Storm water runoff on site also would be collected and treated by the onsite wastewater treatment system for reuse.

Operational Manpower

The proposed project would employ approximately 55 people during routine operations, including 44 positions for the power plant and cement operations, 7 positions for plant management, and 4 positions for plant financial administration. Among the 44 operational positions, 16 employees would staff the power plant and 12 employees would staff the kiln operations 7 days per week, 24 hours per day, in two 12-hour shifts; 16 other employees would staff the power plant during an 8-hour daytime shift along with the management and administrative employees. Final staffing levels would be determined by the operations and maintenance (O&M) contractor.

2.4.9.4 Coal Refuse Site Operations

Coal Preparation Facilities

Coal refuse would be delivered to the prep plant using off-road vehicles. The prep plant facilities would be capable of processing approximately 250 tons (227 metric tons) of coal refuse per hour (190 tons [172 metric tons] per hour planned processing rate with a 40 percent average yield of beneficiated fuel). Beneficiated fuel (ready for combustion) would be delivered by 40-ton dump trailers to the fuel storage facilities at the power plant site.

Operations at the coal refuse supply locations (Anjean, Joe Knob, Green Valley, Donegan, and potentially other sites) would include the extraction of coal refuse from the coal refuse piles and loading into off-road trucks, as well as the receipt of waste ash from the CFB plant and spreading at the remediation locations. The equipment required for coal refuse and ash handling is listed in Table 2.4-5. These assets would be relocated to the respective coal refuse site in use at any given time. Coal refuse operations would employ approximately 70 personnel at the coal refuse sites, including approximately 16 personnel for the prep plant, 12 personnel for the coal refuse operations, and 42 personnel for fuel hauling operations. Operations at the prep plant would require a staff of three to five per shift. Operation is planned for 24-hours/day, seven days per week, at least 85 percent of the time at full operating capacity. Final staffing levels would be determined by the O&M contractor.

Table 2.4-5. Equipment for Coal Refuse Site Operations

Process	Representative Equipment	Quantity
Coal refuse Handling	Cat D8R Tracked Dozer	1
	Cat 988G Wheeled Loader	1
	Cat 775E Off-Road Truck	TBD*
Waste Ash Return Handling	Cat D6N Tracked Dozer	1
	Cat CS-563E Compactor	1
	Cat 16H Motor Grader	1
	Cat 611 Water Truck	1

**TBD – To be determined based on location of prep plant facility*

The sequence of operations for coal refuse handling would include the following:

- Cat D8R tracked dozer (or equivalent) loosens and stockpiles coal refuse.
- Cat 988G wheeled loader (or equivalent) blends coal refuse as necessary and loads into off-road trucks.
- Cat 775E, 70-ton capacity off-road (or equivalent) trucks transport coal refuse to third party beneficiation facility (prep plant) and reload with damp waste ash for the return trip to the coal refuse site.

- On-road trucks transport beneficiated fuel to the power plant site and reload with damp waste ash for the return trip to the coal prep plant site. The contract for hauling fuel to the power plant will require 40-ton load capacity trailers.

The sequence of operations for waste ash handling would include the following:

- Cat 775E (or equivalent) off-road trucks transport waste ash to coal refuse site and dump ash at remediation location.
- Cat D6N (or equivalent) tracked dozer spreads waste ash over the appropriate areas at remediation site.
- Cat 16H (or equivalent) grader is used for haul road maintenance.
- Cat CS-563E (or equivalent) compactor compresses waste ash at remediation site.
- Cat 611 (or equivalent) water truck wets down gravel haul road and remediation site to reduce dust generation.

The Memo of Understanding (MOU) and Prospective Purchaser and Waste Coal Access Agreement between WGC and WVDEP (see Section 2.4.3.1) address management practices at the Anjean site and requirements for a reclamation plan. Requirements of the agreement and the MOU would be extendeded to all coal refuse sites. In accordance with the reclamation plan that would be prepared by WGC and approved by WVDEP in accordance with the agreement and MOU, the following best management practices (BMPs) and procedures would be implemented at the coal refuse sites to mitigate impacts from dust and storm water runoff:

- Water truck will be used to keep dust down on the gravel haul road.
- Grader will be used to keep the gravel road in best possible condition.
- Blend pile will be maintained to blend and allow wet coal refuse to drain/dry prior to transport and thereby minimize black water runoff from trucks.
- Other procedures will be developed in the reclamation plan to minimize black water runoff from the coal refuse during rain events.
- Wheel wash will be located at the bottom of the haul road to remove dust before entering highway.
- All trucks will be covered.
- Roadway speed limits will be observed.
- Water truck will be utilized at the load out area when needed to control dust.
- All truck drivers and operators will be trained to be aware and report any issues that affect dust generation, roadway contamination, roadway deterioration, etc.
- Management will be trained to take action on any such reported issues.

2.5 Applicable Regulations, Permits, and Other Requirements

The major federal and state laws, regulation executive orders, and other compliance actions that would be applicable to the WGC Project are identified in Table 2.5-1. A number of federal environmental statutes address environmental protection, compliance, or consultation. In addition, certain environmental requirements have been delegated to state authorities for enforcement and implementation.

Table 2.5-1. Applicable Regulatory Compliance and Permit Requirements

Statute, Regulation, Order	Description
Federal	
National Environmental Policy Act (NEPA)	This EIS is being prepared to comply with NEPA, the federal law that requires agencies of the federal government to study the possible environmental impacts of major federal actions significantly affecting the quality of the human environment.
Clean Air Act (CAA) • Enacted by Public Law 90-148, Air Quality Act of 1967 • Amended by Public Law 101-549, CAA Amendments of 1990 • Regulations implementing the CAA are found in 40 CFR Parts 50–95.	The CAA establishes National Ambient Air Quality Standards (NAAQS) set by the U.S. Environmental Protection Agency (EPA) for certain pervasive pollutants. Regulations implementing the Clean Air Act are found in 40 CFR Parts 50–95. Applicable Titles: • Title I—Air Pollution Prevention and Control. This Title is the basis for air quality and emission limitations, PSD permitting program, State Implementation Plans, New Source Performance Standards, and National Emissions Standards for Hazardous Air Pollutants. • Title IV—Acid Deposition Control. This Title establishes limitations on sulfur dioxide and nitrogen oxide emissions, permitting requirements, monitoring programs, reporting and record keeping requirements, and compliance plans for emission sources. This Title requires that emissions of sulfur dioxide from utility sources be limited to the amounts of allowances held by the sources. • Title V—Permitting. Although a Title V permit may not be required, this Title provides the basis for the Operating Permit Program and establishes permit conditions, including monitoring and analysis, inspections, certification, and reporting. Authority for implementation of the permitting program is delegated to authorized states, including WVDEP's Division of Air Quality.
Clean Water Act (CWA) • Enacted by Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972 • Amended by Public Law 95-217, Clean Water Act of 1977, and Public Law 100-4, Water Quality Act of 1987 • Regulations implementing the Clean Water Act are found in 40 CFR Parts 104–140.	The CWA focuses on improving the quality of water resources by providing a comprehensive framework of standards, technical tools, and financial assistance to address the many causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. Applicable Titles: • Title III—Standards and Enforcement: o Section 301, Effluent Limitations, is the basis for establishing a set of technology-based effluent standards for specific industries. o Section 302, Water Quality Related Effluent Limitations, addresses the development and application of effluent standards based on water quality goals for the waters receiving the effluent • Title IV—Permits and Licenses: Section 401, Water Quality Certification, required to obtain a federal CWA Section 404 permit from the USACE, or any or any other federal permits or licenses for projects that will result in a discharge of dredged or fill material into any waters of the State. Applications are submitted to WVDEP.

Table 2.5-1. Applicable Regulatory Compliance and Permit Requirements (continued)

Statute, Regulation, Order	Description
	o Section 402, National Pollutant Discharge Elimination System (NPDES), regulates the discharge of pollutants to surface waters. Regulations implementing the NPDES program are found in 40 CFR Part 122. Authority for implementation of the NPDES permit program is delegated to the WVDEP. Treated wastewater from the Rainelle Sewage Treatment Plant (RSTP), which is discharged to the Meadow River, is regulated by WVDEP's NPDES industrial wastewater discharge permit. o Section 404, Permits for Dredged or Fill Material, regulates the discharge of dredged or fill material in the jurisdictional wetlands and *waters of the United States*. The USACE has been delegated the responsibility for authorizing these actions. • Regulations that affect the permitting of this project include: o 40 CFR Part 112—Oil Pollution Prevention. This regulation requires the preparation of a Spill Prevention, Control, and Countermeasure Plan.
10 CFR Part 1022, Compliance with Floodplain and Wetland Environmental Review Requirements ; Executive Order 11988, Floodplain Management ; Executive Order 11990, Protection of Wetlands	• Executive Order 11988, Floodplain Management, directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical. • Executive Order 11990, Protection of Wetlands, requires federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists. • DOE regulation 10 CFR Part 1022 establishes procedures for compliance with these Executive Orders. Where no practical alternatives exist to development in floodplain and wetlands, DOE is required to prepare a floodplain and wetlands assessment discussing the effects on the floodplain and wetlands, and consideration of alternatives. In addition, these regulations require DOE to design or modify its actions to minimize potential damage in floodplains or harm to wetlands. DOE is also required to provide opportunity for public review of any plans or proposals for actions in floodplains and new construction in wetlands. A statement of findings from the assessment ***has been*** incorporated into the Final EIS. ***See Section 4.7 of Volume 1 and Appendix M for an updated assessment of wetland impacts.***
Surface Mining Control and Reclamation Act (SMCRA) of 1977	The SMCRA provides for the federal regulation of surface coal mining operations and the acquisition and reclamation of abandoned mines. Title IV of the SMCRA is designed to help reclaim and restore abandoned coal mine areas throughout the country. Mining and mine reclamation activities associated with the proposed facilities could require permits and approvals from the WVDEP's Office of Abandoned Mine Lands and Reclamation.
Resource Conservation and Recovery Act of 1976 • Enacted by Public Law 94-580, Resource Conservation and Recovery Act (RCRA) of 1976 • Amended by legislation including Public Law 98-616, Hazardous and Solid Waste Amendments of 1984, Public Law 99-499, Superfund Amendments and Reauthorization Act of 1986, and Public Law 104-119, Land Disposal Flexibility Act of 1996	RCRA regulates the treatment, storage, and disposal of hazardous wastes. Project participants would be required to identify any residues that require management as hazardous waste under RCRA (40 CFR Part 261). For some waste streams, this includes testing waste samples using the toxic characteristic leaching procedure or other procedures that measure hazardous waste characteristics. Applicable Title: Title II—Solid Waste Disposal (known as the Solid Waste Disposal Act), regulates the disposal of solid wastes. Title II, Subtitle C—Hazardous Waste Management, provides for a regulatory system to ensure the environmentally sound management of hazardous wastes from the point of origin to the point of final disposal. Title II, Subtitle D—State or Regional Solid Waste Plans.

Table 2.5-1. Applicable Regulatory Compliance and Permit Requirements (continued)

Statute, Regulation, Order	Description
Endangered Species Act of 1973, as amended (16 USC 1536 et seq.) Enacted by Public Law 93-205, Endangered Species Act of 1973 (16 USC 1531 et seq.)	Section 7, "Interagency Cooperation," requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. Under Section 7 of the Act, DOE has consulted with the USFWS (see Section 4.7 of this volume and Appendix B).
National Historic Preservation Act of 1966 Enacted by Public Law 89-665, National Historic Preservation Act of 1966 (16 USC 470 et seq.)	Under Section 106, the head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of the Act a reasonable opportunity to comment with regard to such undertaking. Under Section 106 of the Act, DOE has consulted with West Virginia's Division of Culture and History and the Greenbrier County Historical Society (see Section 4.8 of this volume and Appendix B).
Occupational Safety and Health Act (OSHA) of 1970, as amended (29 USC §651 et seq.) • OSHA General Industry Standards (29 CFR Part 1910) OSHA Construction Industry Standards (29 CFR Part 1926)	Compliance with the OSHA would be required according to OSHA standards. Specifically, the construction and general industry rules in 29 CFR Parts 1910 and 1926 apply.
Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	This Executive Order requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
State	
West Virginia Air Pollution Control Act (APCA)	West Virginia Air Pollution Control Act (APCA) charges the West Virginia DEP with regulating air quality in the state. The DEP adopts and enforces air quality standards, emission control requirements, and other air regulations. The West Virginia clean air program follows the requirements of the federal Clear Air Act (CAA). The EPA and DEP work cooperatively to enforce these requirements. WVDEP's Division of Air Quality has issued PSD Permit (R14-0028) for the WGC Project.
West Virginia CSR 150-03, Rules & Regulations for the Government of Electric Utilities	These rules govern the operation and service of electric utilities subject to the jurisdiction of the Public Service Commission of West Virginia (PSC).
W.Va. Code, Chapter 22, Article 5, Section 1	Air quality permit for coal preparation plants and coal handling operations required to prevent and control air pollution caused by the construction, modification, relocation or operation of coal preparation plants and/or coal handling operations.
Public Land Corporation's Stream Activity Application	***An application must be submitted to the West Virginia Department of Natural Resources' Real Estate Management division for any type of proposed activity within the state's streams. Application must provide details on the type of equipment to be used in the stream, amount of material to be dredged (if any), plan for disposing of dredged materials, length of stream/bank to be worked or type and size of structure to be placed in the stream.***

Table 2.5-1. Applicable Regulatory Compliance and Permit Requirements (continued)

Statute, Regulation, Order	Description
West Virginia Water Pollution Control Act (WPCA)	The principal water quality law in the state of West Virginia is the WPCA. The WPCA designates the West Virginia Office of Water Resources (OWR), within the Division of Environmental Protection (DEP) as the water pollution control agency for the state. The OWR is charged with preserving the integrity of the state's water resources. These water resources include streams, lakes, rivers, wetlands, and groundwater. Under this act, a State 401 certification is required to ensure that any proposed dredge or fill material into waters of the State will comply with state water quality standards.
Water Resources Protection Act	In 2004, the West Virginia legislature passed this Act to gather information regarding the quantity and use of surface and groundwater resources in the State. The WVDEP has been charged with implementing the requirements of the Act. One of the main components of the Act is a survey of large quantity water users (i.e. greater than 750,000 gallons of water during any given month within a calendar year) in the State. Completion of the survey is mandatory for any company or business that meets the above definition.
West Virginia Water Quality Standards	The West Virginia Environmental Quality Board (EQB) sets water quality standards, reclassifies designated water uses, and sets site specific numeric criteria. The West Virginia administrative code sets out the water quality standards for the various water use categories.
WV CSR 150-27, Rules & Regulations for the Transportation of Coal by Commercial Motor Vehicles	These rules govern the transportation of coal upon public highways by commercial motor vehicles in the state of West Virginia. In 2003, the state enacted Senate Bill No. 583 which, among other things, transferred weight enforcement responsibility for all commercial motor vehicles from the Division of Highways (DOH) to the Public Service Commission (PSC). The legislation also authorized the Coal Resource Transportation System (CRTS) to be established and empowered the Commission to develop and enforce the system for permitting vehicles upon the CRTS.

2.6 Alternatives Considered and Determined to Be Reasonable by DOE

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the Proposed Action in an EIS. The term "reasonable alternatives" must be determined in the context of the statutory purpose expressed by the underlying legislation.

As discussed in Section 1.2 (in Chapter 1 of this volume), Congress established the CCPI with a specific goal — to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. The CCPI legislation (Pubic Law No. 107-63) has a narrow focus in directing DOE to demonstrate technology advancements related to coal-based power generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75 percent of the fuel for power generation. DOE's purpose in considering the Proposed Action (to provide cost-shared funding) is to meet the goal of the program by demonstrating the commercial readiness of the WGC's compact, inverted cyclone CFB, which offers a novel approach to converting some waste ash into commercial building products while also integrating power generation with remediation of coal refuse piles.

Congress not only prescribed a narrow goal for the CCPI, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the federal government. Instead of requiring government ownership of the demonstration project, Congress provided for cost-sharing in a project sponsored by the private parties, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE has been placed in the more limited role of evaluating CCPI project applications to determine if they meet the CCPI's goal. It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project.

<u>DOE ALTERNATIVES</u>

DOE has identified and analyzed two reasonable alternatives in this EIS:

(1) Provide cost-shared funding for the WGC Project as proposed, or subject to certain mitigation, for the design, construction, and demonstration of a Co-Production Facility based on an innovative atmospheric-pressure circulating fluidized-bed (ACFB) boiler with a compact inverted-cyclone design ("Proposed Action" – essential features of this alternative are described on p. 2-1 in this chapter).

(2) The second alternative is for DOE not to fund the applicant's proposed project ("No Action").

2.6.1 DOE's Preferred Alternative

As explained in Section 2.6.2 below, WGC has considered various options for implementing a proposed project to design, construct and demonstrate a Co-Production Facility based on an innovative atmospheric-pressure circulating fluidized-bed (ACFB) boiler with a compact inverted-cyclone design. These options are for the power plant site, fuel supply, limestone supply, water supply, material handling and transportation, and power transmission corridor as described in Section 2.6.2 (these options are sometimes referred to in this EIS as "WGC Options"). WGC has identified a specific configuration of these options that WGC would prefer for implementing the project. DOE has conducted an independent analysis of each of WGC's options and has concluded that DOE's preferred alternative is to provide cost-shared funding for the WGC- proposed project implemented in the specific configuration that WGC prefers. That configuration comprises the following options: Option A for the Power Plant Site; all four options for the Fuel Supply Sites; Option A for means of Limestone Supply; Option B for Water Supply; Option A for Truck Transport and Option C for Power Transmission. These options are defined below in Section 2.6.2.

Although DOE here considered only two overall alternatives, it has examined numerous implementing alternatives for the power plant site, fuel supply, water supply, limestone supply, means of transportation, and transmission corridors (these options are described by component group below in Section 2.6.2). For example, DOE has examined three locations for the proposed power plant facility, each of which would change the size of the power plant footprint. Given that one of the advantages of the inverted cyclone technology is that it reduces the plant footprint in comparison to traditional cyclone technology, the size of the footprint is relevant to DOE's decision to fund or not fund. DOE has also examined four different coal refuse sites for fuel supply. These sites vary widely in size and distance from the plant site. DOE has examined secondary and tertiary water supply options that would involve varying degrees of surface (river) water and groundwater. DOE has further considered options for transportation.

These options, in some instances, have distinct environmental impacts. For example, one option for water supply would reduce streamflow in the Meadow River to a greater degree than the other option. This EIS analyzes in detail, the environmental and socioeconomic impacts of these different options. In Section 4.4.3.3, DOE analyzes a number of impacts from the two options, including impacts on average daily flow, water balance and recreational uses. DOE similarly analyzes the environmental impacts from the options for other components of the project (such as power plant siting and transmission corridor siting) in detail.

After considering this range of reasonable implementation options, DOE concluded that providing cost-shared funding for WGC's configuration of options is the Preferred Alternative. Further, DOE gave full consideration to comments received during public scoping and the comment period for the Draft EIS when examining the range of options and related impacts. Other than comments recommending alternatives outside the scope of the purpose and need for agency action and alternatives that DOE has already considered, DOE received no comments from the public in the NEPA public process suggesting a specific alternative that DOE should consider with respect to the WGC Project.

2.6.2 WGC Options

As described in Section 2.4, WGC has considered various options for implementing the proposed project, and is continuing to refine and evaluate options for project components. ***The options, as described in the EIS, are independent and discrete for each project component. For example, Option A under Facilities Siting is not related to Option A under Limestone Supply and are only labeled as such to identify the multiple options under a single project component.*** The project components and options are summarized below, including the identification of WGC's preferred options for project components and an explanation of options that have been eliminated from detailed evaluation in this EIS. Unless otherwise indicated, the options have been carried forward for evaluation in Chapter 4 of this EIS, in which the potential impacts of the proposed WGC Project components and options are described in comparison to the No Action Alternative.

2.6.2.1 Power Plant Site

WGC considered the following options for the location of the proposed facility:

- Option A – E&R Property with a Reduced Power Island Footprint.
- Option B – E&R Property with an Expanded Power Island Footprint and Earthen Berm.
- Option C – E&R Property with an Expanded Power Island Footprint, Earthen Berm, and Rail Spur.

WGC identified Option A as the preferred configuration for the proposed power plant site. Although Options A and B have been carried forward for detailed evaluation in this EIS, WGC has eliminated Option C from further consideration, because the infrastructure improvements required to provide rail access to the plant site and to coal refuse sites would not be economically feasible.

2.6.2.2 Fuel Supply

WGC is considering suitable coal refuse sites that are within approximately 30 miles of Rainelle. As of the completion of the conceptual design for the Co-Production Facility, WGC had identified four coal refuse sites that would serve as the principal fuel sources for the project:

- Anjean Mountain (Buck Lilly)
- Green Valley
- Donegan Mine
- Joe Knob

All four sites would be used as sources of fuel over the course of plant operations, and they are expected to meet WGC's requirements for demonstrating a minimum 20-year fuel supply for the project. All four sites are components of the Proposed Action and they have been evaluated in this EIS in comparison to the No Action Alternative.

Additionally the third-party prep plant would need to be sited at or near the coal refuse piles to ensure economic feasibility and provide off-road vehicle access (where needed) with limited environmental impacts. At this time WGC has identified six candidate sites for the prep plants. More sites may be identified as options, but they would require the same siting criteria as described in Section 2.4.4.2. The six candidate sites are listed below and evaluated in this EIS:

- AN1, AN2, and AN3 – for the Anjean and Joe Knob sites;
- DN1 and DN2 – for the Donegan site; and
- GV – for the Green Valley site.

One candidate site would be selected for each of the three coal refuse areas to process fuel obtained during the course of extraction from the respective area. Due to close proximity, the Anjean and Joe Knob sites would be considered as one coal refuse area served by a single prep plant site.

2.6.2.3 Limestone Supply

WGC considered the following options for sources of calcium carbonate or calcium oxide material for the project:

- Option A – Truck limestone from the Boxley Quarry in Alta (for the boiler) and Mill Point (for the kiln), with trucking the responsibility of the quarry or other third party.
- Option B – Truck limestone from Greystone quarry or other permitted quarry in the Lewisburg area (for the boiler) and Mill Point (for the kiln), with trucking the responsibility of the quarry or other third party.
- Option C – Truck limestone from an acceptable quarry in the Lewisburg area (for the boiler), with trucking the responsibility of the quarry or other third party, and barge material with high calcium oxide content (for the kiln) to Charleston and truck it under contract to the site.

WGC identified Option A as the preferred means of limestone supply for the project. Although Options A and B have been carried forward for detailed evaluation in this EIS, WGC has eliminated Option C from further consideration, because the transport of calcium oxide material via barge and truck would not be economically feasible.

2.6.2.4 Water Supply

WGC intends to use effluent from the Rainelle Sewage Treatment Plant as the primary source of process water for the power plant. To augment this source during periods of reduced effluent discharge from the RSTP, WGC proposes to use the following options for supplemental sources of process water:

- Option A – Groundwater would provide the secondary source of process water supply for the power plant, and surface water would be the tertiary source. Potential groundwater sources would include Production Well Number 1 (PW-1), PW-3, and other potential wells located outside the drawdown area for PW-1, PW-3 and the Rainelle public water system wells. During periods when groundwater withdrawals would cause unacceptable drawdown of the local aquifer, surface water would be withdrawn from the Meadow River using a temporary intake structure as a supplemental source of process water supply.

- Option B – Surface water would provide the secondary source of process water supply for the power plant, and groundwater would be the tertiary source. Water from the Meadow River would be withdrawn at a permanent intake structure in the vicinity of the RSTP and conveyed to the WGC plant using the same pipeline as the RSTP effluent. During periods when withdrawals would cause the flow in the Meadow River to decline below 60 percent of ***the average annual or seasonal*** flow (i.e., ***based on the Tennant Method,*** the river flow rate above which adverse water quality and aquatic habitat impacts would not be expected), groundwater would be withdrawn from PW-1, PW-3, and other potential wells as a supplemental source of process water supply. ***Since the Draft EIS was published, river withdrawal guidelines have been developed by WVDNR, including recommended flows to be maintained (as previously discussed in Section 2.4.6). Potential impacts to surface water and groundwater resources, based on the state guidelines, are discussed in Sections 4.4.4.3 and 4.6.3.4 of this volume, respectively.***

WGC identified Option B as the preferred means of process water supply for the project. Both options have been carried forward for detailed evaluation in this EIS.

2.6.2.5 Material Handling and Transportation

WGC considered the following options for transportation of fuel supplies:

- Option A – Truck transport.
- Option B – Rail transport.

As described in Section 2.4.7, WGC concluded that rail transport would not be economically feasible and, therefore, Option B was eliminated from further consideration. Truck transport, Option A, has been evaluated as the only feasible means of transportation for fuel supplies in this EIS.

2.6.2.6 Power Transmission Corridor

WGC considered the following options for transmitting the generated electricity to the national grid:

- Option A –Widen existing ROW to Grassy Falls Substation to accommodate new poles and lines.
- Option B – Upgrade existing AEP poles to carry WGC lines to Grassy Falls Substation.
- Option C – Construct new transmission corridor to Grassy Falls Substation.

WGC has identified Option C as the preferred means of power transmission for the project. However, all three options have been evaluated in this EIS.

2.6.3 Alternatives Eliminated From Further Consideration

2.6.3.1 Alternative Coal Technologies

Alternative types of clean coal technologies (e.g., a conventional cyclone design collector rather than an inverted cyclone design collector) or coal type (e.g., high quality coal) are not reasonable alternatives. Such alternatives would not demonstrate a commercial application of the compact, inverted cyclone CFB design that converts waste ash into commercial building products while also integrating power generation with remediation of coal refuse piles. In particular, alternative fuel types such as high-grade coal, oil or gas are outside of the scope of the Proposed Action because they would displace refuse fuel. The use of refuse fuel is a key reason why the WGC Project advances the CCPI's objectives and influenced the selection of the project by DOE. Alternative plant designs that would result in plants larger than those analyzed in this EIS would undermine one of the key advantages of the inverted cyclone design, which is to reduce the footprint of the plant.

A note on design modifications to reduce the "carbon footprint" of the WGC Project: ***The alternative of incorporating technologies to reduce the "carbon footprint" of the WGC Project during the demonstration period was also considered. DOE recognizes that fossil fuel burning is the primary contributor to increasing carbon dioxide (CO_2) concentrations in the atmosphere (IPCC, 2007). CO_2 is a significant greenhouse gas, and increasing concentrations of greenhouse gases show correlation with global warming. Although CO_2 emissions are not currently regulated under the Clean Air Act, and a viable U.S. market currently does not exist for carbon credits as an incentive to reduce emissions, DOE is concerned about the implications of fossil fuel use on global climate change. Therefore, DOE oversees parallel research programs aimed at reducing the cost of electricity associated with power production and proving the viability of technologies for carbon capture and sequestration (CCS) to reduce CO_2 emissions from fossil fuel use. DOE expects that the combined efforts of these programs will enable large-scale plants to come on-line by 2020 that offer 90 percent carbon capture with99 percent storage permanence at less than a 10 percent increase in the cost of energy services (NETL, 2007).***

However, the planned in-service date and CCPI demonstration for the WGC Project is well in advance of the timeline for achieving the DOE CCS goal. At present, mitigation of CO_2 emissions via geologic sequestration is not viable for CFB technology because the CO_2 is exhausted at low pressure (15-25 psi) and at dilute concentrations (3-15 percent by volume). For this reason, in part, CO_2 capture and sequestration is not a reasonable option for the WGC project at this time. For further information on greenhouse gas impacts from the WGC Project, see Section 4.3.3.2, under Greenhouse Gases.

2.6.3.2 Alternative Energy Sources

Because the CCPI's purpose is to encourage the development of clean coal technologies, alternative energy sources (e.g., wind or solar) would not meet the principal objective of the CCPI for which the WGC Project was proposed. DOE deems that such alternatives are not reasonable because they are outside of the scope of the purpose and need for agency action.

2.7 Comparison of Alternatives

Table 2.7-1 summarizes the potential impacts for the No Action Alternative in comparison to the Proposed Action. The impacts for each environmental resource are based on the analysis found in Chapter 4.

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Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts

Resource	No Action	Proposed Action
Aesthetic Resources	No change in existing conditions; however, adverse impacts from degraded landscapes at coal refuse sites would remain.	**Power Plant Facilities:** • Option A – Most adverse impacts during construction and operation would occur for the nearest residential properties (located within 1,500 ft (460 m) east of the plant site), including approximately 12 single-family homes, a 52-unit apartment complex, a nursing and rehabilitation center, and approximately 12 mobile homes. The 300-ft (91-m) tall exhaust stack and portions of the 150-ft (46-m) tall boiler building would be visible from various locations in Rainelle. • Option B – The aesthetic impacts would be comparable to Option A. Although the site footprint would be larger, an earthen berm would be provided for noise mitigation and may limit the view of the power plant from adjacent properties. **Fuel Supply:** Extraction of coal refuse would occur at sites in remote areas that were used historically for mining purposes. ***With the exception of Anjean, all coal refuse sites have been reclaimed. Thus, use of fuel supply at Anjean would provide a beneficial impact at this location.*** Reclamation of the sites following completion of extraction would ***ensure continuation of*** long-term aesthetic benefits. The optional sites for the fuel prep plants would be located in remote areas in the vicinities of the coal refuse sites. **Limestone Supply:** Option A or B would obtain limestone from commercial quarries near Lewisburg, approximately 20 mi (32 km) and 40 mi (64 km), respectively, from Rainelle. Both options may also obtain a higher quality limestone from a commercial quarry in Mill Point, approximately 60 mi (97 km) from Rainelle. Aesthetic impacts would be comparable to existing conditions, because extraction would occur within permitted areas of active commercial quarries. **Water Supply:** Water supply structures, including the effluent pipeline from the Rainelle Sewage Treatment Plant (RSTP) to the power plant site, generally would be located within existing utility right-of-ways (ROWs) and would not affect viewsheds permanently. **Material Transportation:** The transport of fuel from the prep plant sites to the power plant would occur on existing heavy haul roadways used for coal and lumber transport regionally. The transport of limestone from the quarries to the power plant would also occur on existing heavy haul roadways. In the worst case, trucks would make a total of 97 round trips (mainly on US 60 and WV 20 or CR 1, depending on source of fuel – see Figure S-1) to the site daily. **Power Transmission:** All three transmission options would include the development of a 100-ft (30-m) wide power transmission line ROW from the plant site approximately 4,000 ft (1,220 m) northwest to an existing American Electric Power (AEP) ROW, which would affect the viewshed along a 9.2-ac (3.7-ha) corridor. • Option A – Widening of the existing AEP ROW by approximately 50 ft (15 m) for 17 mi (27 km) to the Grassy Falls substation would affect the viewshed along a 103-ac (42-ha) corridor. • Option B – Upgrading existing structures along the AEP ROW would not substantially alter the existing viewshed along the corridor after completion of construction. • Option C – The development of a new 17-mi (27-km), 100-ft (30-m) wide ROW to the Grassy Falls substation would affect the viewshed along a 206-ac (83-ha) corridor.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Atmospheric Conditions	No impact; no change in existing conditions.	**Power Plant Facilities:** Emissions would be identical regardless of the option selected for the plant site. Stationary emissions of priority pollutants would comply with National Ambient Air Quality Standards (NAAQS). Volatile organic compounds (VOCs) emissions would be below the prevention of significant deterioration (PSD) threshold***, while NO_x, CO, SO_2, H_2SO_4, PM, and Be would be above the thresholds. For the pollutants that would exceed the PSD thresholds, a BACT analysis was performed.*** The Class II PSD increment consumption by power plant emissions for sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (<10 microns [PM_{10}]) would range between 25% and 75% depending upon the pollutant and associated averaging time. The highest increment consumption would occur for PM_{10} emissions (24-hr averaging time) in the immediate vicinity of the site. ***See Table 4.3-6, Class II Prevention of Significant Deterioration (PSD) Increment Consumption, for modeling results.*** Visibility analysis in Class I areas predicted a total of 6 days over a 3-yr period in which the 5% change in light extinction threshold could be exceeded. However, meteorological records suggest that these occurrences may be attributable to natural obscuring conditions (such as fog, clouds, and rain). The plant is expected to meet the Clean Air Mercury Rule limitations and is not expected to discharge objectionable odors. The plant would emit up to 0.87 million tons (0.79 million metric tons) annually of carbon dioxide ([CO_2] a greenhouse gas). ***Although capture and geologic sequestration of CO_2 is not feasible for this project,*** potential plans to provide for the capture and use of waste heat from the power plant for potential commercial, industrial, and residential uses may offset the plant's CO_2 emissions in the range of 0.18 million tons per year (0.16 million metric tons) to 0.32 million tons per year (0.29 million metric tons). **Fuel Supply:** The extraction and processing of coal refuse would result in emissions of fugitive dust (total suspended particulates [TSP] and PM_{10}) that would be comparable for all coal refuse sites and prep plant locations. Emissions would be contained within site boundaries through the use of dust suppression activities in accordance with WV Rules 38 CSR 2. Most of the prep plant system would be enclosed and equipped with control devices such as fabric filters. **Limestone Supply:** Option A or B would obtain limestone from active commercial quarries. The increased production to supply the WGC plant would be accommodated within existing permits for these quarries. Depending upon the future demand for limestone and site-specific quarry operation plans, increases in PM_{10} and TSP air emissions could occur over existing conditions at the commercial quarry sites. It is expected that increased levels of these pollutants would generally be limited to the quarry sites, ***as the concentrations of these pollutants would rapidly dissipate with distance from the activity generating the emissions. The increase in production would be regulated under and bound by existing operating permits, which incorporate standard industry measures to prevent the degradation of atmospheric resources***. **Water Supply:** Construction of the water supply facilities would cause short-term impacts from fugitive dust and vehicle emissions. **Material Transportation:** Screening for mobile emissions sources based on guidelines established by U.S. Environmental Protection Agency (EPA) indicated that transportation activities would have *de minimis* impacts on air quality. **Power Transmission:** Operation of the power transmission lines would not affect air quality. Construction of the lines would result in short-term impacts from fugitive dust and vehicle emissions. • Option A – Widening the existing AEP ROW would require ground-disturbing activities along a 103-ac (42-ha) corridor. • Option B – Upgrading existing structures along the AEP ROW would disturb the least land area of the options. • Option C – The development of a new ROW would require ground-disturbing activities along a 206-ac (83-ha) corridor.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Surface Water Resources	No change in existing conditions; however, adverse impacts from acid mine drainage at coal refuse sites would remain.	**Power Plant Facilities:** Impacts on surface waters during plant construction would be minimized through the implementation of an erosion and sedimentation (E/S) control plan required for a National Pollutant Discharge Elimination System (NPDES) General Construction Permit. Potential impacts during operation would be minimized through the implementation of a storm water management pollution prevention (SWMPP) plan and a groundwater protection (GWP) plan based on the WV Department of Transportation (WVDOT) and the WV Department of Environmental Protection (WVDEP) requirements. • Option A would result in the least impact on surface waters. Post-development runoff was calculated as 55.7 ft^3/s (vs. 67.1 ft^3/s during pre-development). • Option B would result in slightly higher impact on surface waters. Post-development runoff was calculated as 57.6 ft^3/s (vs. 67.1 ft^3/s during pre-development). **Fuel Supply:** Temporary impacts of coal extraction on water resources***, such as increased sedimentation resulting in a decrease in water quality,*** would be minimized through the implementation of planned E/S control features (***via best management practices [BMPs]***). Reclamation of the sites under agreements with WVDEP would provide long-term benefits to water quality. The impacts from discharge of storm water runoff from coal refuse piles at the prep plant sites would be minimized through the use of storm water retention ponds at the sites. • Anjean – Although the three candidate sites for the prep plant at Anjean would have similar impacts, AN3 would be within the same sub-watershed as the existing Anjean treatment ponds. • Donegan – Although the two candidate sites for the prep plant at Donegan would have similar impacts, DN1 would be within the same sub-watershed as the existing Donegan treatment ponds. **Limestone Supply:** ***Option A or B would obtain limestone from existing commercial quarries. Thus, potential impacts would be comparable to projected baseline conditions. The increase in production to supply the WGC plant would be regulated under the existing operating permits for these quarries, which incorporate measures to prevent the degradation of surface water resources***. **Water Supply:** The diversion of up to 100% of the RSTP effluent ***(up to approximately 1.5 cfs)*** to the WGC plant for primary water supply would have a long-term beneficial impact on Meadow River water quality because of the elimination of a biological oxygen demand (BOD) source. WGC would derive the balance of 350 to 800 gpm (1,300 to 3,000 L/min) from groundwater and/or surface water sources. To avoid adverse impacts to aquatic habitats, WGC would monitor flows in the Meadow River and limit withdrawals to avoid reductions in flow levels below a state-recommended threshold (see below). • Option A – As the tertiary source of process water supply, withdrawals from the Meadow River would occur only intermittently to make up a smaller proportion of the balance of process water required by the WGC plant during low aquifer conditions. ***The streamflow would be reduced by a maximum of approximately 1.6 to 2.0 cubic feet per second at the end of a 25-year period.*** • Option B – As the secondary source of process water supply, withdrawals from the Meadow River may reduce base flows to make up a larger proportion of the process water required by the WGC plant, but withdrawals would not be made when flows could fall below 60% of the annually or seasonally adjusted average ***flow*** (i.e., below the flow rate above which water quality and aquatic habitat impacts would not be expected), or another comparable withdrawal limitation measure determined in consultation with the state. ***Since publication of the Draft EIS, WVDNR has provided base flow thresholds to be maintained: 178 cfs April through September and 118 cfs October through March. The maximum water demand that the proposed power plant would require is approximately 2.7 cfs, which represents less than 1% of Meadow River's average annual flow. Furthermore, based on the thresholds, withdraw from the river would be limited to high flow conditions. Therefore, impacts to the river are expected to be minor. The streamflow would be reduced by a maximum of approximately 0.8 cubic feet per second at the end of a 25-year period.*** **Material Transportation:** The use of a truck or wheel wash at the power plant and prep plant to clean fuel delivery trucks prior to exiting the site would minimize potential impacts on surface water quality from runoff of contaminants released in transportation corridors. **Power Transmission:** Operation of the power transmission lines would not affect surface water quality. Short-term impacts on water quality during construction of the transmission lines would be minimized through the implementation of a SWMPP plan and a GWP plan based on WVDOT and WVDEP requirements. Power poles would not be erected within surface waters. • Option A – Widening the existing AEP ROW would require the clearing of a 103-ac (42-ha) corridor. • Option B – Upgrading existing structures along the AEP ROW would affect the least land area of the options.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Floodplains	No impact; no change in existing conditions.	**Power Plant Facilities:** Displacement of the floodplain for Sewell Creek would not increase the 100-year flood elevations over the Federal Emergency Management Agency (FEMA) designated height of 1 ft (0.3 m) above existing conditions in the local upstream area. • Option A would result in the least impact on the floodplain, requiring 16 ac (6.5 ha) to be filled. The greatest increase in water elevation for a 100-yr flood would be 0.48 ft (0.15 m). • Option B would result in slightly higher impact on the floodplain, requiring 20 acres to be filled. The greatest increase in water elevation for a 100-yr flood would be 0.67 ft (0.20 m). **Fuel Supply:** No impacts on floodplains would occur at any of the coal refuse sites. • Anjean – All 3 prep plant candidate sites appear to be outside of the 100-yr floodplain, but AN1 is situated in a topographic depression that could be subject to high water. Potential impacts would be avoided through effective site layout and design. • Donegan – Neither candidate prep plant site, DN1 or DN2, is within a floodplain. • Green Valley – Candidate prep plant site GV is not within the 100-yr floodplain, but it is situated near Hominy Creek and could be subject to high water. Potential impacts would be avoided through effective site layout and design. **Limestone Supply:** The increase in production to supply the WGC plant for Option A or B would occur in permitted areas within active commercial quarries and would not affect floodplains. **Water Supply:** The construction of the water supply pipeline would not alter the floodplain, and its location underground would protect it from flood impacts. • Option A – The use of a temporary intake structure on Meadow River would not affect flood flows. • Option B – The permanent intake structure and inlet pool on Meadow River would be designed to prevent an increase in the 100-yr flood elevations upstream by more than 1 foot (0.3 m). **Material Transportation:** The transport of fuel and limestone by trucks would not affect the floodplain. **Power Transmission:** The construction of power transmission facilities would not affect 100-yr floodplains in the respective corridors for Option A, B, or C. Power poles may be situated near stream banks where required but would not obstruct flood flows.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Geology and Groundwater Resources	No change in existing conditions; however, adverse impacts from acid mine drainage at coal refuse sites would remain.	**Power Plant Facilities:** Impacts from ground-disturbing activities would be minimized through the implementation of an E/S control plan as specified for a NPDES General Construction Permit and based on WVDOT and WVDEP requirements. Areas of competent rock encountered at the plant site may necessitate blasting, which would require a permit from the WV Fire Marshall that would outline measures to avoid or minimize short-term impacts. Fuel and material storage areas would be situated on slabs that would be drained to a lined collection pond to minimize release of pollutants to groundwater. Ammonia storage and handling would be located on top of a diked concrete area and comprise of control devices and safety procedures to minimize the potential release of aqueous ammonia to soil or groundwater. • Option A would require the least disturbance of land area for the plant footprint (17 ac [6.9 ha]). • Option B would require somewhat greater disturbance of land area for the plant footprint (20.3 ac [8.2 ha]). **Fuel Supply:** Extraction of coal refuse at all sites would cause potential impacts from accelerated erosion and acid mine drainage (AMD) generation. However, the recovery and reclamation processes would by carefully managed to minimize impacts in accordance with a NPDES General Permit and a remediation plan approved by WVDEP. Ultimately, the long-term reductions in AMD afforded by the remediation of the coal refuse sites are expected to outweigh the short-term increases in AMD generation during extraction. Although an analysis of ash samples indicated that both fly ash and bottom ash contain metals, the Toxic Characteristic Leaching Procedure (TCLP) analysis indicated that the leaching of metals from the ash in significant concentrations would not be expected ***(e.g., values for arsenic and mercury were less than 0.069 and 0.0078, respectively, for both fly ash and bottom ash; see Table 4.6-3 for TCLP results)***. The prep plant would use a closed loop system requiring 100 gpm (380 L/min) of water, which would be supplied by new wells to be constructed on respective sites. Prep plant operations would be the same regardless of site selected. **Limestone Supply:** Option A or B would obtain limestone from existing commercial quarries. The increase in production to supply the WGC plant would be regulated under the existing operating permits for these quarries, which incorporate measures to prevent the degradation of groundwater resources. **Water Supply:** Groundwater pumping tests have indicated that withdrawals from groundwater wells could potentially draw down the local aquifer. Therefore, WGC would ensure that the power plant maintains an adequate supply of process water without adversely affecting the Rainelle water supply and local private wells. ***Draw down levels are expected to be less than the depth of the city well pumps, and therefore, would not adversely impact the local water supply.*** WGC would obtain permits and meet specific requirements prior to initiating additional groundwater withdrawals for supplemental process water in either Option A or B. • Option A – As the secondary source of process water supply, withdrawals from groundwater wells would make up a larger proportion of the process water required by the WGC plant, which could potentially affect aquifer drawdown. ***The streamflow would be reduced by a maximum of approximately 1.6 to 2.0 cubic feet per second at the end of a 25-year period.*** • Option B – As the tertiary source of process water supply, withdrawals from groundwater wells would make up a smaller proportion of the process water required by the WGC plant, which would not be expected to affect aquifer drawdown. ***Since publication of the Draft EIS, WVDNR has provided base flow thresholds to be maintained for the Meadow River. Additionally, the ongoing groundwater study referenced in the Draft EIS has now been completed and reviewed by DOE and has been added to the Final EIS (Appendix D2); however, general impact conclusions remain unchanged. The streamflow would be reduced by a maximum of approximately 0.8 cubic feet per second at the end of a 25-year period.*** **Material Transportation:** The use of a truck or wheel wash at the power plant and prep plant sites to clean fuel delivery trucks prior to exiting the site would minimize potential impacts on groundwater from the infiltration of contaminants released in transportation corridors. **Power Transmission:** Operation of the power transmission lines would not affect geology, soils, or groundwater. Short-term impacts during construction of the transmission lines would be minimized through the implementation of a SWMPP plan and a GWP plan in accordance with WVDOT and WVDEP requirements. • Option A – Widening the existing AEP ROW would require the clearing of a 103-ac (42-ha) corridor. • Option B – Upgrading existing structures along the AEP ROW would affect the least land area of the options. • Option C – The development of a new ROW would require the clearing of a 206-ac (83-ha) corridor. ***Up to 2.5 acres of soils classified as prime farmland soils or farmland could be impacted as a result of construction and/or routine maintenance along the corridor***.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Biological Resources (Including Wetlands)	No change in existing conditions; however, adverse impacts from acid mine drainage at coal refuse sites would remain.	**Power Plant Facilities:** The power plant site has lost most of its original ecological resource value as a result of prior land-disturbing activity. Extensive adjacent acreage of undisturbed upland ***areas*** offer higher quality habitat. The project is not expected to impact any protected species. • Option A would result in the clearing of approximately 15 ac (6 ha) of mostly re-growth vegetation and the loss of ***0.26*** ac (***0.10*** ha) of wetlands. **(*As the design phase finalizes, wetlands impacts as listed in this EIS may differ slightly from values listed in the final wetland permit due to refinements of the design. WGC is in the process of consulting with the USACE for the wetland permitting process to identify wetland impacts and methods for avoiding and minimizing impacts and developing suitable forms of wetland mitigation.)*** • Option B would result in greater loss of vegetation and wetland acreage than Option A, including the filling of an oxbow on Sewell Creek and the potential enclosure of an unnamed tributary on the east side of the site. **Fuel Supply:** Coal refuse sites offer habitat of limited value. Recovery and reclamation processes would be carefully managed to minimize impacts in accordance with a remediation plan approved by WVDEP. Ultimately, the coal refuse sites would be reclaimed to an extent that would surpass existing conditions and improve the quality of existing habitat and wetland areas in the vicinity. • Anjean – Of the candidate sites for a prep plant, AN1 has the greatest potential for involving a wetland; but impacts would be avoided through effective site planning and design. • Donegan – Neither candidate prep plant site, DN1 or DN2, contains wetlands. • Green Valley – Candidate prep plant site GV is located near an emergent wetland area that has been vegetated by an invasive plant species. Detailed site planning and design would avoid the emergent wetland area. **Limestone Supply:** Options for obtaining limestone supply from commercial quarries would not affect biological resources. **Water Supply:** The construction of the water supply pipeline would have a temporary impact on a small emergent wetland (***0.03*** ac [***120*** m^2]) along Sewell Creek that would be restored at the end of construction. To avoid potential adverse impacts on aquatic ecosystems, WGC would monitor flows in the Meadow River and limit withdrawals to avoid reductions in flow levels below a state-recommended threshold (see below). Therefore, adverse impacts to aquatic habitat are not expected to occur, so long as the threshold is maintained. • Option A – As the tertiary source of process water supply, withdrawals from the Meadow River would occur only intermittently to make up a smaller proportion of the balance of process water required by the WGC plant during low aquifer conditions. • Option B – As the secondary source of process water supply, withdrawals from the Meadow River may reduce base flows to make up a larger proportion of the process water required by the WGC plant, but withdrawals would not be made when base flows could fall below 60% of the annually or seasonally adjusted average ***flow*** (i.e., below the flow rate above which water quality and aquatic habitat impacts would not be expected), or another comparable withdrawal limitation measure determined in consultation with the state. ***Since publication of the Draft EIS, WVDNR has provided base flow thresholds to be maintained: 178 cfs April through September and 118 cfs October through March. The maximum water demand that the proposed power plant would require is approximately 2.7 cfs, which represents less than 1% of Meadow River's average annual flow. Furthermore, based on the thresholds, withdraw from the river would be limited to high flow conditions. Therefore, impacts to aquatic resources are expected to be minor.*** **Material Transportation:** The use of a truck or wheel wash at the power plant and prep plant sites to clean fuel delivery trucks prior to exiting the site would minimize potential impacts on aquatic ecosystems from runoff of contaminants released in transportation corridors. **Power Transmission:** The permanent loss of wildlife habitat in areas along the proposed power line corridor could displace some dependant species. However, displaced wildlife could continue to use the adjacent undisturbed areas or migrate to abundant comparable habitat nearby. The utility corridor may also create new habitat for edge-dependent species. Wetlands would be avoided during construction as practicable and wetland impacts would be temporary. • Option A – Widening the existing AEP ROW would require the clearing of a 103-ac (42-ha) corridor. • Option B – Upgrading existing structures along the AEP ROW would affect the least land area of the options. • Option C – The development of a new ROW would require the clearing of a 206-ac (83-ha) corridor and potentially affect approximately 5 ac (2 ha) of wetlands, although none would be lost.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Cultural Resources	No impact; no change in existing conditions.	***None of the project components associated with the Proposed Action would occur on, or otherwise affect, federally-recognized Native American tribal lands.*** **Power Plant Facilities:** The WV State Historic Preservation Office (WV SHPO) concurred with the conclusion of a Phase I survey that the proposed project would not have an effect on any potential archaeological resources at the plant site for Option A or B. An historic resources survey concluded that the undertaking would have no effect on National Register of Historic Places (NRHP)-eligible resources and would not alter the existing setting or character of the Rainelle Historic District. The WV SHPO stated that it would issue its findings about the potential for visual impacts on architectural resources after considering comments by the public and the Greenbrier County Historical Society on the Draft EIS. ***Since publication of the Draft EIS, the Greenbrier County Historical Society and the WV SHPO have sent comment letters on the Draft EIS (see Appendix B). The WV SHPO did not identify any specific concerns, but stated that they would complete their review upon receipt of public comments and the Phase I transmission survey, which was completed in October 2006 (see Appendix G). Due to refinements of the transmission corridor, additional Phase I surveys will be conducted and submitted to WV SHPO as an addendum to the October 2006 report; therefore, DOE and WGC will continue consultation with WV SHPO as required under the National Historic Preservation Act (NHPA) Section 106 review process with respect to public comments and ongoing refinements of the transmission line location (Segment C).*** **Fuel Supply:** All of the coal refuse sites have been extensively disturbed by previous mining operations, which would have destroyed any archaeological resources on the sites. None of the sites contain buildings or structures eligible for the NRHP. • Anjean – All three candidate sites for a prep plant (AN1, AN2, and AN3) have been disturbed extensively by prior mining operations and subsequent reclamation efforts, which would have destroyed existing archaeological resources. There are no buildings or structures located on any of the sites. • Donegan – Candidate prep plant site DN1 would be situated on previously developed land occupied by a building used during prior mining operations that is not eligible for the NRHP. DN2 contains no structures and occupies agricultural property that would be evaluated in consultation with the WV SHPO for the potential to affect unrecorded archaeological resources prior to construction. • Green Valley – The GV candidate prep plant site is located on the edge of the disturbed coal refuse site and contains no structures. **Limestone Supply:** The quarries that would supply limestone to WGC in Option A or B are ongoing commercial operations, and the increased production would not affect historic or archaeological resources. **Water Supply:** Most of the proposed pipeline corridor has served as a utility ROW for public service district (PSD) #2 or has otherwise been disturbed. In undisturbed segments, final adjustments in the pipeline alignment would be determined in consultation with the WV SHPO to avoid potential impacts on unrecorded archaeological resources. **Material Transportation:** The transport of fuel and limestone by trucks would occur on designated heavy haul routes and would not affect cultural resources. **Power Transmission:** The alignment common to all three options extending from the WGC plant site to the AEP ROW was determined not to contain any high-probability areas for archaeological resources. • Option A – The area to be widened along the AEP ROW would be surveyed and evaluated in consultation with the WV SHPO, and final adjustments in the alignment would be made to avoid potential resources. • Option B – Upgrading existing structures along the AEP ROW would occur in previously disturbed areas. • Option C – The proposed new corridor would be surveyed and evaluated in consultation with the WV SHPO and final adjustments in the alignment would be made to avoid potential archeological resources.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Socioeconomics	No change in existing conditions; however, the area would lose the potential for a needed stimulus to prevent further decline in the local economy and the working-aged population.	**Power Plant Facilities:** Construction and operation of the power plant would increase local employment opportunities and provide economic stimulus to area businesses without displacing existing residents or businesses or adversely affecting current trends in population growth and the demand for housing. During construction, the project is expected to employ an average of 185 individuals per month over a 29-month period. During the demonstration phase and subsequent commercial operation, the proposed project would employ approximately 126 full-time personnel and result in an additional 114 jobs from indirect economic activity. • Option A – Most adverse impacts on residential property values would affect the nearest residential properties (located within 1,500 ft (460 m) east of the plant site), including approximately 12 single-family homes, a U.S. Department of Agriculture (USDA) Rural Development property (a 52-unit apartment complex), a nursing and rehabilitation center, and approximately 12 mobile homes. • Option B – The power plant would affect the same residential properties as indicated for Option A; however, the site footprint would be larger and the eastern site boundary would be even closer to the properties. **Fuel Supply:** The reclamation of degraded coal refuse sites and remediation of AMD impacts would provide potential beneficial socioeconomic impacts to the local communities, county, and state. All six candidate prep plant sites are located in remote areas and would not affect nearby residential property values. **Limestone Supply:** The increased demand on regional quarries under Option A or B would have potential beneficial impacts on these commercial enterprises that would ultimately extend to the regional economy. **Water Supply:** The water supply pipeline would follow an existing ROW and cross other open lands. Pipeline construction would have limited, short-term adverse impacts on adjacent properties. **Material Transportation:** The transport of fuel and limestone by trucks would occur on designated heavy haul routes. Residential properties along the routes may be affected by increased truck traffic and noise. **Power Transmission:** The alignment common to all three options extending from the WGC plant site to the AEP ROW would not displace residents or businesses or affect property values. • Option A – The widening of the AEP ROW would not displace residents or businesses, and property owners would be compensated for granting an easement. • Option B – Upgrading structures along the AEP ROW would occur within an existing easement. • Option C – The proposed new power transmission corridor would not displace residents or businesses, and property owners would be compensated for granting an easement.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Environmental Justice	No change in existing conditions; however, the area would lose the potential for a needed stimulus to help reduce the high percentage of low-income residents.	**Power Plant Facilities:** The overall impacts of the Proposed Action on local residents generally would be favorable, although adverse impacts would affect the residents nearest the site of Option A or B as described for Socioeconomics (i.e., increased traffic and associated emissions, long-term adverse impacts on property values). As defined by the President's Council on Environmental Quality (CEQ) a "minority population" area is an area where the percentage of defined minorities exceeds 50 percent of the population. The proportion of minorities in the region of influence for the power plant site does not exceed 50%, and it is not meaningfully greater than the proportion of minorities in the larger local jurisdictions, county, and state. Therefore, the proposed power plant would not have a disproportionately high and adverse impact on minority populations. Because the general population of western Greenbrier County represents a "low-income population" compared to the county and state, the adverse impacts of the power plant would affect low-income populations regardless of where it would be sited in the region. However, the proportion of low-income residents nearest the site of Option A or B does not exceed 50%, and it is not meaningfully greater than the proportion in the general population of western Greenbrier County. Moreover, construction and operation of the power plant would increase local employment opportunities and provide economic stimulus to help reduce the high percentage of low-income residents locally. Therefore, the proposed power plant would not have a disproportionately adverse impact on low-income populations. **Fuel Supply:** The extraction and processing of fuel at any of the coal refuse sites and candidate prep plant sites would not have a disproportionately high and adverse impact on minority populations or low-income populations. **Limestone Supply:** Option A or B would obtain limestone from quarries that are ongoing commercial operations and would not have a disproportionately high and adverse impact on minority populations or low-income populations. **Water Supply:** The construction and operation of water supply features would not have a disproportionately high and adverse impact on minority populations or low-income populations. **Material Transportation:** The transport of fuel and limestone by trucks would occur on designated heavy haul routes and would not have a disproportionately high and adverse impact on minority populations or low-income populations. **Power Transmission:** None of the optional alignments for power transmission would have a disproportionately high and adverse impact on minority populations or low-income populations.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Land Use	No impact; no change in existing conditions.	**Power Plant Facilities:** Although the region of influence is not subject to a zoning ordinance or land use plan, the power plant would be located on disturbed land near areas used historically for industrial activities. Potential business opportunities arising from the proposed project could cause land uses surrounding the power plant to change. The three communities sponsoring the project envision the development of an industrial park (EcoPark) on adjoining vacant land that was previously designated for such use but has not been developed. • Option A – Most adverse impacts during construction and operation would occur for residential properties located within 1,500 ft (460 m) east of the plant site, including approximately 12 single-family homes, a 52-unit apartment complex, a nursing and rehabilitation center, and approximately 12 mobile homes. In addition, the Rainelle Elementary School and Rainelle Medical Center are located 2,000 ft (610 meters) north of the proposed power plant site, although no adverse impacts are anticipated for these facilities. • Option B – The power plant would affect the same residential properties as indicated for Option A; however, the site footprint would be larger and the eastern site boundary would be even closer to the properties. **Fuel Supply:** The reclamation of degraded coal refuse sites would render these sites potentially available for other uses beneficial to the local communities, county, and state. All six candidate prep plant sites are located in remote areas characterized by open lands. All sites would be subject to a property availability investigation and coordination with the property owners to ensure that impacts on land use would be avoided. **Limestone Supply:** Option A or B would obtain limestone from quarries that are ongoing, permitted commercial operations, and these existing land uses would not change. **Water Supply:** The water supply pipeline would follow an existing ROW and cross other open lands. Pipeline construction would have limited, short-term adverse impacts on adjacent land uses. **Material Transportation:** The transport of fuel and limestone by trucks would occur on designated heavy haul routes and would not alter adjacent land uses. The proposed truck storage area in Charmco is a vacant and disused former commercial property. **Power Transmission:** The alignment common to all three options extending from the WGC plant site to the AEP ROW crosses a 17-ac (7-ha) property west of WV 20 that is owned by Rainelle and reserved for recreational use. This property would be subject to a land exchange for comparable acreage along US 60 west of the AEP ROW. • Option A – The widening of the AEP ROW would affect a 103-ac (42-ha) corridor adjacent to an existing cleared power line ROW, and landowners would be compensated for granting an easement. • Option B – Upgrading structures along the AEP ROW would occur within an existing easement. • Option C – The development of a new ROW would require the clearing of a 206-ac (83-ha) corridor. The route would not traverse populated land areas and would not cross any parks, trails, or byways based on preliminary investigation. Landowners would be compensated for granting an easement.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Community Services and Utilities	No change in existing conditions that have resulted in the decline of the working-aged population and increased the demands on community services by an aging population.	**Power Plant Facilities:** The proposed power plant (Option A or B) would not impose excessive demands on community services and utility systems during construction and operation, nor is the project expected to induce unsupportable development locally. Impacts would be avoided by ensuring that waste products are characterized and disposed of properly. Construction activities and anticipated injuries may increase the short-term demand on medical services. **Fuel Supply:** The reclamation of degraded coal refuse sites would render these sites potentially available for other uses beneficial to the local communities, county, and state. During the processing of coal refuse at candidate prep plants, spoils would be separated into disposable aggregates and marketable (pyrite-containing) byproducts. Impacts would be avoided by ensuring that waste products are characterized, handled, and disposed of properly in accordance with a remediation plan approved by WVDEP. **Limestone Supply:** Option A or B would obtain limestone from quarries that are ongoing, permitted commercial operations and would not affect the demand for community services or utilities. **Water Supply:** The maximum water demand by the WGC power plant would be approximately 1,200 gpm (4,500 L/min), to which ***the Rainelle Sewage Treatment (RSTP) would supply 100% of its effluent (the RSTP's monthly discharge ranges from*** approximately ***400*** to ***600*** gpm [***1,500*** to ***2,300*** L/min]). The RSTP would require modifications to its National Pollutant Discharge Elimination System (NPDES) permit. The balance would be obtained from a combination of groundwater and/or surface water sources. Depending upon aquifer recharge conditions, project-related groundwater withdrawals could adversely impact the Rainelle water supply as indicated by groundwater pumping tests. Therefore, WGC would ensure that the power plant maintains an adequate supply of process water without adversely affecting the Rainelle water supply and local private wells. Final design for the power plant would require a closer evaluation of the maximum water demands and sources. WGC would obtain permits and meet specific requirements prior to initiating additional groundwater withdrawals for supplemental process water in either Option A or B. • Option A – As the secondary source of process water supply, withdrawals from groundwater wells would make up a larger proportion of the balance of process water required by the WGC plant. • Option B – As the tertiary source of process water supply, withdrawals from groundwater wells would make up a smaller proportion of the balance of process water required by the WGC plant. **Material Transportation:** The transport of fuel and limestone by trucks would occur on designated heavy haul routes and would not affect demands on community services. **Power Transmission:** WGC would provide new 138 kV transmission infrastructure from the power plant site to the Grassy Falls Substation. A feasibility study by the Pennsylvania-Jersey-Maryland Interconnection (PJM) concluded that the direct connection of the WGC facility to the Allegheny Power System (APS) grid at Grassy Falls could be accommodated with network reinforcements. • Option A would construct new power transmission infrastructure parallel to the AEP transmission lines in an expanded ROW. • Option B would upgrade the existing AEP transmission infrastructure to support the WGC load. • Option C would construct new power transmission infrastructure along a new ROW to Grassy Falls.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Traffic and Transportation	No impact; no change in existing conditions.	**Power Plant Facilities:** Existing roadway capacities are adequate to accommodate the additional traffic volumes during construction and operation of the proposed power plant (Option A or B) without causing adverse traffic delays at any of the intersections studied. See Material Transportation below for traffic related to fuel and limestone transport. **Fuel Supply:** Smaller county roads (CR 1 and CR 39/14) would be affected by traffic volumes generated during construction of the prep plants at respective optional sites. However, because the construction traffic volumes are expected to be fairly low, they are not expected to degrade intersection delays beyond level of service (LOS) "C" at any of the optional prep plant sites. For traffic related to fuel transport, see Material Transportation. **Limestone Supply:** Option A would include the pairing of the ***Boxley Quarry in Alta,*** a quarry near Lewisburg (***20*** mi [32 km] from Rainelle), with one in Mill Point (60 mi [97 km] from Rainelle). Option B would include Greystone quarry (approximately 40 mi [64 km] from Rainelle) and also Mill Point. For traffic related to limestone transport, see Material Transportation. **Water Supply:** Temporary traffic volumes generated by construction of water supply facilities would not cause adverse traffic delays. **Material Transportation:** The trucking of fuels, limestone, and other materials would occur on designated heavy haul routes and would not degrade intersection delays by more than LOS "***C***" at any of the intersections studied. However, slower-moving heavy-haul trucks would likely increase travel times on local roads, especially CR 1, CR 39/14, US 60, and WV 20 between the prep plant sites and the power plant site. • Anjean/***Joe Knob*** – ***The Anjean and Joe Knob coal refuse piles are approximately 18 mi (29 km) and 18.5 mi (30 km), respectively, from the power plant site.*** All three candidate prep plant sites are located along the same route. AN3 is the farthest distance (18 mi [29 km]) from the power plant site. AN1 and AN2 are both 14 mi (23 km) from the power plant site. • Donegan – ***The Donegan coal refuse pile is approximately 28 mi (45 km) from the power plant site.*** Candidate prep plant sites DN1 and DN2 are 28 mi (45 km) and 21 mi (34 km), respectively, from the power plant site along the same route. • Green Valley – The GV ***coal refuse pile and*** candidate prep plant site are located 13 mi (21 km) from the power plant site. **Power Transmission:** Temporary traffic volumes generated by construction of power transmission facilities would not cause adverse traffic delays for any of the three options. Operation of the power transmission lines would not affect local traffic.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Public Health and Safety	No impact; no change in existing conditions.	**Power Plant Facilities:** Worker safety impacts during construction of the proposed power plant (either Option A or B) would result in an estimated 23 recordable incidents, 12 lost workdays, and 0.04 fatalities per year based on national statistics. Worker safety impacts during operation of the power plant (either Option A or B) would result in an estimated 2 recordable incidents, 0.03 lost workdays, and 0.02 fatalities per year. The highest incremental carcinogenic risk from plant emissions for a sensitive receptor population would be ***0.0011*** x 10^{-4} for an adult subsistence fisher compared to an EPA acceptable risk criterion of 1.0 x 10^{-4}. The highest incremental non-cancer health risk for a sensitive receptor population would be ***0.02347*** for a resident child compared to an EPA acceptable risk criterion of 1.0. A few residential properties to the east fall near the 600-ft radius, the worst-case release impact area for aqueous ammonia. In the unlikely event of a release, people within this radius may be exposed to ammonia concentrations that are immediately dangerous to life or health. No population receptors, beyond on-site workers, fall within the 300-ft radius, the 'more likely' release impact area. Incremental increases in PM_{10} and particulate matter (<2.5 microns [$PM_{2.5}$]) concentrations would occur, but would not exceed the NAAQS. **Fuel Supply:** Worker safety impacts during operations at the coal refuse and prep plant sites would result in an estimated 2 recordable incidents, 2 lost workdays, and <0.001 fatalities per year based on national statistics. **Limestone Supply:** Option A or B would obtain limestone from commercial quarries that would not experience a change in worker safety conditions as a result of the Proposed Action. **Water Supply:** Worker safety impacts during construction of the proposed water supply facilities (Option A or B) would represent a small increment in the safety impacts indicated above for construction of the power plant. **Material Transportation:** Worker safety impacts during trucking operations for fuel and limestone would result in an estimated 3 recordable incidents and 1 lost workday per year based on national statistics. The anticipated annual accident rates for the transportation of fuel from coal refuse sites based on national statistics would be: • Anjean (and Joe Knob) – ***0.76*** injuries and ***0.04*** fatalities. • Donegan – ***4.20*** injuries and ***0.23*** fatalities. • Green Valley – ***0.89*** injuries and ***0.05*** fatalities. **Power Transmission:** Worker safety impacts during construction of the proposed power transmission facilities (Option A, B, or C) would represent a small increment in the safety impacts as indicated above for construction of the power plant.

Table 2.7-1. Summary Comparison of Alternatives and Potential Impacts (continued)

Resource	No Action	Proposed Action
Noise	No impact; no change in existing conditions.	**Power Plant Facilities:** Most adverse impacts during plant construction (either Option A or B), including blasting noise and vibration, would occur for residential properties located within 1,500 ft (460 m) east of the plant site (see Aesthetic Resources). These impacts would be temporary and intermittent. Blasting, if required, would occur over a relatively short time period and be mitigated in accordance with a blasting plan required by the WV Fire Marshall. During operations, noise impacts from plant equipment lacking acoustic mitigation would exceed the impact criterion of a 60 dBA day-night equivalent sound level (L_{dn}) at all receptor sites modeled, including the residential properties located within 1,500 ft (460 m) east of the plant site (68.3 dBA L_{dn}). However, WGC is agreeing to incorporate noise attenuation and mitigation measures into the final design that would ensure operational noise levels would not exceed the impact criterion of 60 dBA L_{dn} at each identified receptor site. Acoustic mitigation requirements would range from 1.5 to 11.3 dBA L_{dn} depending upon receptor site location. WGC would voluntarily provide post-construction monitor noise levels to ensure minimal noise impacts to sensitive noise receptors. ***Steam blow-offs would occur that would result in a noise level of 125 dBA (95 dBA with mitigation) at the source; however, such events would be temporary and infrequent, occurring only during start-up and maintenance operations.*** **Fuel Supply:** Coal refuse sites and candidate prep plant sites are located in remote, sparsely populated areas where coal mining has occurred in recent times or is still occurring. Among the candidate prep plant sites, only DN2 is located in proximity to a residence (of the site owner) that could be affected by plant noise. **Limestone Supply:** Option A or B would obtain limestone from existing quarries that represent ongoing, regulated commercial operations that would not change appreciably from baseline conditions. **Water Supply:** Short-term, intermittent daytime noise impacts would occur during construction of water supply facilities. **Material Transportation:** Traffic-related noise during construction and operation is expected to fall below the impact criterion of a 10 dBA incremental increase above background conditions. The peak incremental increase in traffic noise in Rainelle caused by fuel transport from coal refuse sites would be 2.9 dBA during mid-day traffic at the WV State Police Barracks (WV 20 at Tom Raine Drive). The peak incremental increases in traffic noise associated with fuel transport from respective coal refuse sites would be: • Anjean (and Joe Knob) – 6.3 dBA increase during PM peak traffic on CR 1 at Anjean (same for fuel transport from Donegan). • Donegan – 5.7 dBA increase during PM peak traffic on CR 39 at Donegan. • Green Valley – 1.7 dBA increase during PM peak traffic on WV 20 at Quinwood. **Power Transmission:** Short-term, intermittent daytime noise impacts would occur during construction of power transmission infrastructure.

Abbreviations: *ac = acres; AEP = American Electric Power; AMD = acid mine drainage; APS = Allegheny Power System; BOD = biochemical oxygen demand; CEQ = President's Council on Environmental Quality; CO = carbon monoxide; CO_2 = carbon dioxide; CR = county road; dBA = decibels (A scale); E/S = erosion and sedimentation; EIS = Environmental Impact Statement; EPA = U.S. Environmental Protection Agency; FEMA = Federal Emergency Management Agency; ft = feet; ft^3/s = cubic feet per second; gpm = gallons per minute; GWP = groundwater protection; ha = hectares; km = kilometers; kV = kilovolt; L/min = liters per minute; L_{dn} = day-night equivalent sound level; LOS = level of service; m = meters; m^2 = square meters; mi = miles; NAAQS = National Ambient Air Quality Standards;* ***NHPA = National Historic Preservation Act****; NO_x = nitrogen oxides; NPDES = National Pollutant Discharge Elimination System; NRHP = National Register of Historic Places; PJM = Pennsylvania-Jersey-Maryland Interconnection; PM_{10} = particulate matter, <10 microns; $PM_{2.5}$ = particulate matter, <2.5 microns; PSD = prevention of significant deterioration; PSD = public service district; ROW = right-of-way; RSTP = Rainelle Sewage Treatment Plant; SO_2 = sulfur dioxide; SWMPP = storm water management pollution prevention; TCLP = Toxic Characteristic Leaching Procedure; TSP = total suspended particulates; USDA = U.S. Department of Agriculture; VOC = volatile organic compound;* ***WV SHPO = West Virginia State Historic Preservation Office****; WVDNR = WV Division of Natural Resources; WVDEP = WV Department of Environmental Protection; WVDOT = WV Department of Transportation; yr = year.*